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This Week in The IRON AGE

Vol. 155, No. 7 February 15, 1945

Editorial

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Technical Articles

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Features

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News and Markets

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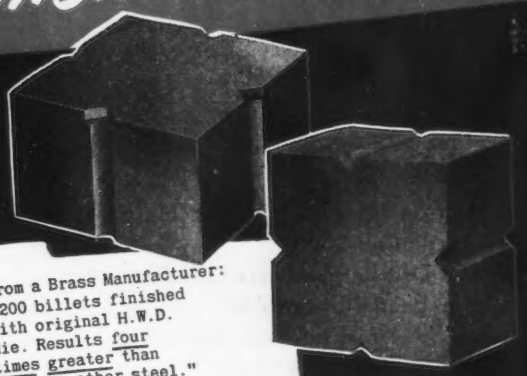
HIGH PRODUCTION RECORDS TELL THE STORY



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from an Automotive Manufacturer:
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from a Forge Company:
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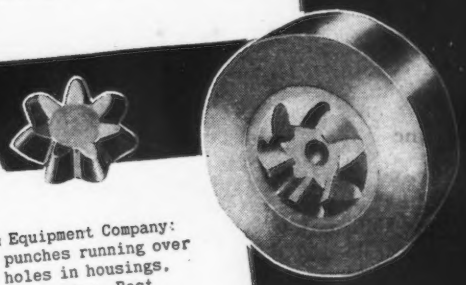
"150,000 barrels per die—average production of seamer rolls of Cromovan Die Steel for heading steel barrels."



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from a Wheel Manufacturer:
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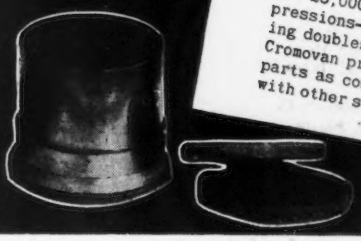

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The
IRON AGE

ESTABLISHED 1855

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Feb. 15, 1945

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Fitting the Peg to the Hole

PREVIOUSLY, I have touched upon the current pressures leading in the direction of state ownership, which is an alias for state socialism. Under pure, or even under impure, state socialism, the state becomes the owner of manufacturing facilities, farms and other property. Taking possession naturally leads to having the deciding voice in the appointment of those controlling the management of industry and business.

Under these circumstances and with the impossibility of divorcing politics from state ownership, the natural conclusion would be that politicians would eventually find ways and means to appoint the managers of our industrial and other establishments.

I think that this is self-evident from the record established in Russia under communism; in Germany under nazism and in Italy under fascism: Three different names for one thing, namely, state socialism.

So let's imagine that we have reached, in this country, the ultimate goal of the leftists, in which the Amalgamated Motors Corporation of America is seeking to employ a chief elettrical engineer.

For your information, as background for the ensuing scene, let me say that Amalgamated Motors is a government owned corporation combining General Motors, Ford, Chrysler and what have you in the automotive field.

By what process of equity or otherwise, the ownership and control of these corporations was shifted from private to political hands is beside the question. The point is that the power of making many hundreds of appointments to responsible positions as managers of industrial and business affairs has been taken out of the private enterprise arena and tossed into the political bull-ring.

So the scene as now envisioned is laid in the Senate Chambers, where Joe Doakes is being considered as a nominee for the position of chief electrical engineer of Amalgamated Motors.

Now do not let me give you the false impression that Joe sought this job. I am sure that he, aware that he knew nothing about electricity, would never in the world have made application for it. But being what is known as a "lame duck", and having because of public opinion been kicked out of one political office, the powers that be had him in the card file for first consideration when government took over industry.

So Joe Doakes goes up before a Senate Committee which is to pass upon his qualifications for this electrical engineering job. After the ordeal is over, Joe goes back to his best friend, who asks him what happened. "Well," said Joe, "they asked me if I believed in God; whether I was right handed, left handed or ambidextrous and whether I preferred Mr. Stalin to Mr. Roosevelt or both."

"What did you tell them?" inquired his friend.

"I answered 'yes' to all of the questions," replied Joe, "and I think I have the job cinched."

"Did they ask you what was the difference between a watt and a kilowatt?" asked the friend.

"Yes," and I told them: "What's the difference."

Which all goes to show that it is not what you know, or what you are that determines your job under a state controlled economy, but whom you know.

J. H. Van Deventer

Many test casts are made in Inland's search for new and better steels.

Invest in Victory—Buy More War Bonds and keep them.

Steel samples from pilot casts undergo photo-micrographic analysis.

New Inland Steels for Tomorrow

Inland makes steel in heats of a few pounds each for experimental purposes, and in production heats of 100 to 150 tons. The small experimental heats are run in two induction type furnaces, located in an especially equipped department of the main laboratory. These pilot heats are the forerunners of the steels for tomorrow.

Making small casts of steel is one phase of Inland's continuous research for better methods of producing steel, and for better steels *that* will make better products.

It is Inland research that already has produced low-alloy, high-yield strength Hi-Steel, and lead-bearing, faster machining Ledloy. The newest creation of Inland research is Ti-Namel—the new vitreous enameling alloy steel to which a white enamel cover coat is applied direct to the base metal. Ti-Namel assures superior quality finish, longer life, and lower shop costs.

These new Inland steels, and those that are yet to come, will be important to manufacturers competing in peacetime markets.

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The IRON AGE
February 13, 1945

NEWS FRONT

The U. S. will have operational squadrons of jet-propelled fighters in action very soon, probably within the fortnight.

Industrial activity in France is still at a very low ebb, through absolute poverty in raw materials and lack of such routine items as workmen's gloves, etc.

Pre-invasion commitments for raw materials have not been filled. A promise of 10 shiploads of materials for January resulted in only 4 shiploads being delivered.

The desperate plight of industry there, will be partially corrected soon as greater shipments will be made in a month or so.

Current production in France for the war effort is confined to some small steel cans, a few batteries, heavy cotton duck, and some heavy bridge girders.

French industrialists are running out of money. By law idle workmen are paid 75 per cent of their wage by the plant, and the Government later makes these payments good. Since invasion, however, the government has not covered these payments, and has just announced that the industries will be investigated as to profits during the occupation to determine whether such payments will be made.

Introduction of the isothermal treatment in liquid baths for Army Ordnance pistol parts has resulted not only in considerably fewer rejections of heat treated parts but further has increased total pistol life.

The cartridge extractor was the first part to be subjected to austempering. In running the first practical tests, 100 extractors were heated by immersion in a liquid bath at 1500 deg. F., followed by transfer to another liquid bath held at a fixed temperature of 600 deg. F. In addition to fitting the form gages after this process with required hardness at all testing points, these extractors when held in a vise close to the extraction hook could be bent by hammer blows inward or outward from the cartridge at a 90 deg. angle without fracture.

And: Endurance tests showed extractions of 15,000 and 20,000 with no deformation at the extraction hook and no loss of spring tension.

Other parts now being subjected to austempering with similarly improved properties are the barrel bushings, safety locks, ejectors, disconnectors, barrel links and firing-pin stop plates.

Boron additions to an 18-4-1 high speed steel have been found to lower cutting speeds for a given tool life when compared with untreated steels having the same chemical analysis and Brinell hardness.

Also: Machinability of the steel was impaired by the addition of boron. Chips from the boron-treated steel seemed to be more continuous and not so well broken up as the untreated steel. Chip coils from bars with boron additions were larger than those of the untreated steel when turned at the same speed.

Ladle additions of titanium to aluminun-killed steel in the ratio of 4.5 titanium to 1 carbon will add to the enameling quality of steel sheets. This addition converts the carbon in steel to a more stable form, thus preventing its reaction with oxides in the enamel coatings to form gas and blisters.

Steel sheets so treated also have improved drawing qualities without requiring any special heat treatment. With the careful control of processing, pickling and enameling, one-coat, one-fire finishes may be obtained.

Three-quarters of the 1200 prime ordnance pieces used by the armed forces have been either considerably improved or completely redesigned since the start of the war emergency.

Loss of tungsten supplies in Namyung, China, due to Japanese army drives will have no effect on steel production here. Although imports were steady three years ago, higher prices have encouraged ample production in this country and Bolivia.

Imports have been made during the last two years only when unusually large amounts of air cargo space have been available.

Revelation that a large group of experimental fighters built for the Army Air Forces is not scheduled for quantity production emphasizes the fact that fighter development is now almost exclusively in the jet field.

Bell's all-plywood XP-77 and Vultee's all magnesium XP-54 are relegated to the "might have been" class, although postwar possibilities for the midget P-77 design conception are mentioned.

Effect of Boron

On Machinability and Hardenability

. . . Tests on the influence of boron in a medium carbon resulphurized open hearth steel indicate an increase in hardenability of 31 percent, and, as anticipated, an impairment of 5 percent or more in machinability.

o o o

By T. G. HARVEY

Metallurgical Engineer, Monarch Steel Co., Indianapolis, Ind.

o o o

THE purpose of this investigation was to ascertain the effect of boron on the machinability and hardenability of a free machining steel. The base composition of this steel is as follows:

	Per Cent
Carbon	0.40 to 0.50
Manganese	1.15 to 1.50
Sulphur	0.20 to 0.30
Phosphorus	Low
Silicon	Low

The number of the heat used was 52509. The ladle analysis of this steel follows:

	Per Cent
Carbon	0.44
Manganese	1.49
Phosphorus	0.016
Sulphur	0.227
Silicon	0.06
Nickel	0.01
Chromium	0.02

Two ingots were treated with ferroboron. Ingot "A" which showed 0.0020 per cent boron by spectrographic analysis was rolled into 1 9/16 in. bars which were later die-drawn to 1.512 in. diameter. Ingot "B" which showed 0.0024 per cent boron by spectrographic analysis was rolled into 2 1/16 in. bars.

Material from a random untreated ingot was rolled into 2 in. diameter bars and subsequently die drawn to 1 15/16 in. diameter.

The grain size of the steel without boron was found to be 6 by the Shepherd method. The boron-treated material showed an 8 grain size.

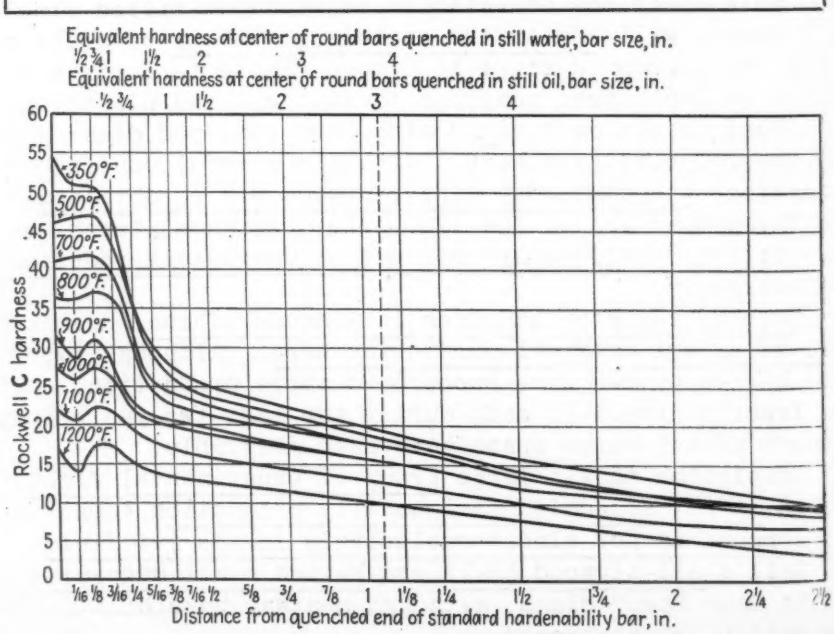
Jominy end quenched hardenability tests were done in the Monarch laboratory on the untreated steel and on mateal from Ingot "A."

The tests were machined from full sized bars and not normalized. It had been previously found that this steel seemed to have a better hardenability when not normalized.

These tests were made by quenching and tempering the specimens before grinding and running the hardness traverse. This technique was used as it has been found to give a more ac-

FIG. 1—End quenched hardenability test on X1545 steel, heat 52509, non-boron-treated; 0.44 C, 1.49 Mn, 0.016 P, 0.227 S, 0.06 Si, 0.02 Cr, and 0.01 Ni. Grain size 6. Quenched at 1550 deg. F and tempered.

	1200 Deg. F.	1100 Deg. F.	1000 Deg. F.	900 Deg. F.		800 Deg. F.	700 Deg. F.	500 Deg. F.	350 Deg. F.
0	16, 16.5, 17, 18, 16	21.5, 22, 22.5, 22.5, 22	27.5, 27.5, 28, 28, 28	31.5, 31.5, 32, 31.5	0	36, 36, 36, 36.5, 35.5	40.5, 41, 41, 40.5	45, 46, 46, 46.5, 46	54, 54, 53.5, 54
1/16	13.5, 14, 14	21.5, 18, 20.5	26, 26	27.5, 26, 30.5	1/16	35, 36	41.5, 41.5, 41.5	44.5, 46.5 47.5	48.5, 51.5, 50.5
1/8	17.5, 18	22.5, 23, 23	26.5, 28, 28.5	29.0, 32, 31.5	1/8	36, 37, 37.5	41, 42, 43	47, 47, 47.5	49.5, 51.0, 51.5
3/16	17	21.5	26	27.5	3/16	35, 36.5	39.5	43	45.5, 48.5
1/4	15	18.5	21.5	22.0	1/4	28.5, 30	30.5	35	33.0, 36.5
3/8	13	17.0	20	20.5	3/8	22.5	24	27.5	25.0, 27.0
1/2	13	16.0	19.5	19.5	1/2	22.0	23	25.0	23.5
5/8	12	14.5	18.0	18.0	5/8	21.0	21	24.0	22.5
3/4	11.5	14.5	17.0	17.5	3/4	19.5	20	22.0	21.5
7/8	11.0	13.5	16.5	16.5	7/8	18.0	19	21.0	20.0
1	9.5	13.0	15.5	15.5	1	17.5	18	20.0	18.5
1 1/4	9.0	11.0	14.5	15.0	1 1/4	16.0	15.5	18.5	16.5
1 1/2	8.0	10.0	12.0	14.5	1 1/2	13.0	14	16.0	14.0
1 3/4	6.5	8.5	11.0	12.12	1 3/4	12.0	12	12.5	12.0
2	5	7.5	10.0	11.5	2	11.0	10	12.0	11.0
2 1/2	3	6.5	8.0	9.5	2 1/2	7.5	9	9.5	9.5, 10.0



curate picture of the hardenability. Results of these tests are found in Figs. 1 and 2.

Fig. 3 shows the results of Jominy tests run in another laboratory. Material used in these tests was forged to approximate size, machined into specimens and then normalized before quenching.

It can be concluded from the charts that the Grossman ideal critical diameter for the untreated steel is about 1.6 in. and for the boron-treated steel 2.1 in. It might also be stated that the untreated steel will harden through (to 50 per cent or more martensite) in water in a 1⅛ in. round and in oil in a ⅝ in. round. The boron treated steel will harden through in water in a 1.4 in. round and in oil in a 0.85 in. round. The ideal critical diameter computed from grain size and composition for the untreated steel was 1.44 in. and for the boron-treated steel (ingot "A") was 1.74 in.

The untreated die drawn steel of 1 15/16 in. diameter received a draft of 6.1 per cent. It was stress annealed to a hardness of 217 BHN.

The boron-treated steel of 1.512 in. diameter was also reduced about 6 per cent in drawing. The hardness produced by stress annealing in this steel was also 217 BHN.

Machinability tests were made at the University of Michigan under the supervision of Professor O. W. Boston.

These tests were run dry. The results were plotted as tool life vs. cutting speed in surface ft. per min.

The tools of Red Cut Superior (18-4-1) high-speed steel with the following shape: 8-14-6-6-6-15-3/64. This means the tool had 8 deg. back rake, 14 deg. side rake, 6 deg. end relief, 6 deg. side relief, 6 deg. end cutting angle, 15 deg. side cutting edge angle and 3/64 in. nose radius. A second series of cuts was made in which a tool was ground to the shape 0-12-10-2-15-0 so that it would fail in a preliminary way at relatively low speeds when taking light cuts of 0.100 in. depth and 0.00077 in. feed.

Now to quote from Prof. Boston's report:

"The results of the first, or roughing, tests are shown in Fig. 4. The circles represent the results of tool life for a particular cutting speed—in other words for a 200 ft. per min. speed, the tool life was found to be 0.66 min. The straight line passing

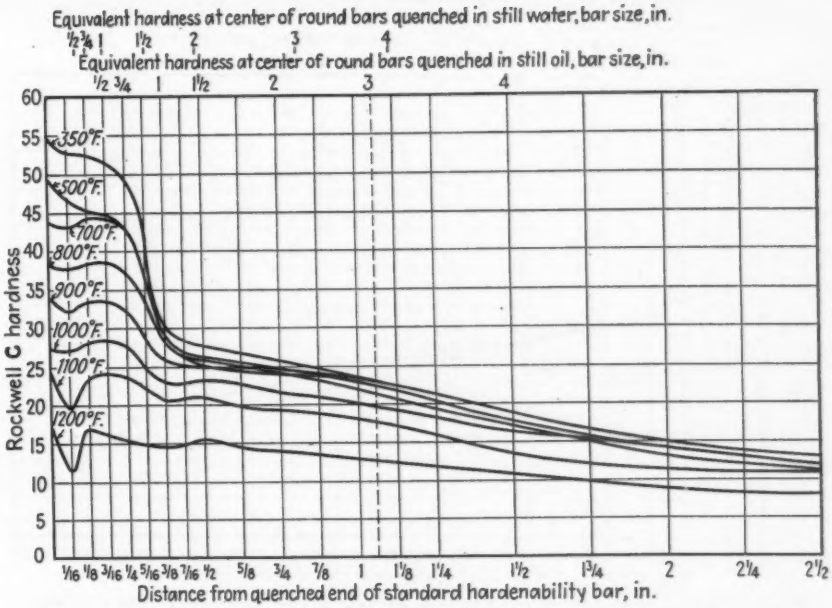


FIG. 2—End quenched hardenability test for X1545 steel, heat 52509; 0.44 C, 1.49 Mn, 0.016 P, 0.227 S, 0.06 Si, 0.02 Cr, 0.01 Ni, and 0.002 B. Ingot "A", grain size 8. Quenched at 1550 deg. F. and tempered.

	1200 Deg. F.	1100 Deg. F.	1000 Deg. F.	900 Deg. F.		800 Deg. F.	700 Deg. F.	500 Deg. F.	350 Deg. F.
0	17.5, 17.5, 17.5, 17.5	25, 24.5, 24.5, 24	27.5, 27.5 27.5	33.5, 34, 34.5, 34	0	38, 38, 38.5, 38.5, 37.5	44, 44, 44, 44, 43.5	50, 50, 48.5, 49.5, 49.5	54, 54.5 55.5, 56
1/16	11, 11.5	17.5, 21, 19.5	26, 27, 27	30.5, 32.5, 32.0	1/16	37.5, 37.5	42, 43, 43.5	43.5, 46,5, 48.5	47.5, 53 52.5
1/8	15, 17, 18.5	23, 24, 24	27.5, 30 28.5	33, 33.5, 34.0	1/8	39, 38.5	42.5, 44.5, 44.5	42.5, 47, 45	49.5, 52.5 53.5
3/16	16.0	23.5, 25	28.5	33.5	3/16	38, 39.5	42.0, 44.5, 44.5	41.5, 45.5, 48	50.5
1/4	15.5	25, 19.5 24	28.0	32.5	1/4	37	40, 43, 43	41, 44	49.5, 49.5, 49.5
3/8	14.5	20.5, 20, 21	22.5, 25, 22	25, 26, 25.5	3/8	28	28.5	28	30, 30, 31
1/2	15.5	21, 21, 21.5	23.0, 25, 22.5	25.5	1/2	26	26.5	26	28
5/8	14.5	19.5	22.0, 23 22	25.0	5/8	24.5	25.5	25	26
3/4	14.0	19.5	21.5	24.5	3/4	24.5	24.0	24.5	25.5
7/8	14.0	18.5	21.0	24.0	7/8	23.5	23.0	23	24.5
1	13.0	18.0	20.0	23.5	1	23	22.5	22	24
1¼	12.0	16.0	19.0	20.5	1¼	21	20.5	19.5	21
1½	11.0	13.5	16.5	19.0	1½	19	18.0	17.5	19
1¾	9.5	12.0	15.5	16.5	1¾	16	15, 16, 16.5	15.5	16.5
2	9.0	12.5	14.5	15.0	2	15.5	14	13.0	15.0
2½	8.0	10.5, 11.5	12.0	13.5, 12.5	2½	14	13, 13.5	11.5	14, 5, 13

through these points has a slope (n) of 0.106. The cutting speed for a 1-min. tool life (C) is 192. The cutting speed for a 5-min. tool life is 161 and for a 30-min. tool life is 132 ft. per min. The tool life for a cutting speed of 150 ft. per min. is 9.8 min. as shown in the graph. The crosses represent the experimental data when turning the boron-treated bars. It is seen that the value of C is only 182, the slope (n) is slightly steeper at 0.115, V_5 is only 151 compared to 161 for the non-boron-treated steel, and the tool life for 150 ft. per min. cutting speed is only 5.3 for the treated bar compared to 9.8 for the non-treated bar. These tests show conclusively that the boron treated bars of the same Brinnel hardness, but of 8 instead of 6 grain size, do not give cutting speeds for a given tool life as high as the non-treated steel bars.

"It has many times been observed that when taking light cuts, as in screw machine work, the machinability ratings have been reversed. Inasmuch as it was felt that it was to be expected that the boron-steel would machine at higher speeds than the non-treated, a second series of tests using a very light feed were run. The results are shown in Fig. 5. The sharp-nosed tool and zero back rake angle was to simulate screw machine tools; the side rake was 12 deg., and the side relief 10 deg., corresponding to commercial screw machine practice. The circles represent the data in Fig. 5

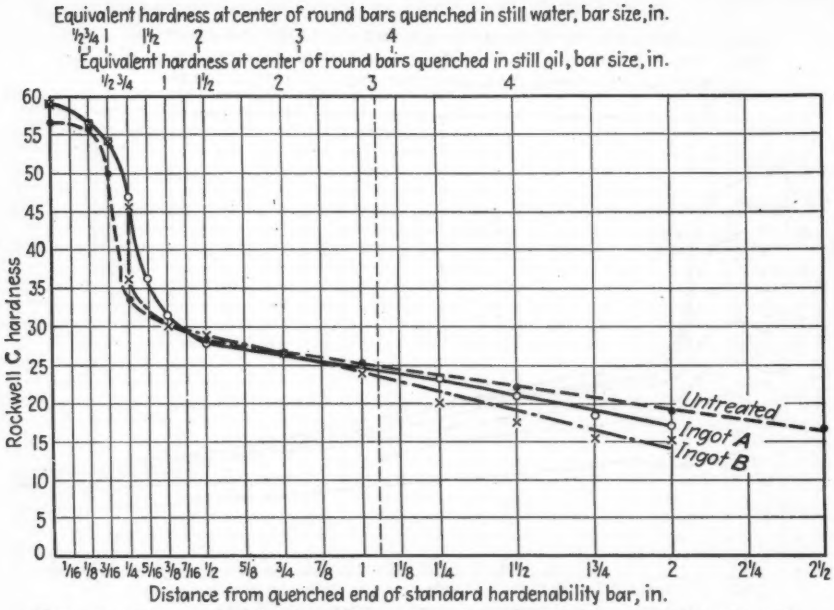


FIG. 3—End quenched hardenability tests on heat 52509. Untreated: 0.44 C, 1.49 Mn, 0.016 P, 0.227 S, 0.06 Si, 0.02 Cr, 0.01 Ni, grain size 6. Ingot "A": 0.44 C, 1.49 Mn, 0.016 P, 0.227 S, 0.06 Si, 0.02 Cr, 0.01 Ni, 0.002 B, grain size 8. Ingot "B": 0.44 C, 1.49 Mn, 0.016 P, 0.227 S, 0.06 Si, 0.02 Cr, 0.01 Ni, 0.0024 B, grain size 8.

	No Boron	"A"	"B"		No Boron	"A"	"B"
0	56.5	59.0	59.0	1	25.5	25.0	24.0
1/8	56.0	56.5	56.5	1 1/4	24.0	23.0	20.0
1/4	33.0	47.0	36.0	1 1/2	22.0	21.0	17.5
3/8	29.5	31.5	30.0	1 3/4	20.5	18.5	15.5
1/2	28.5	28.0	29.0	2"	19.0	17.0	15.0
3/4	27.0	26.5	26.5				

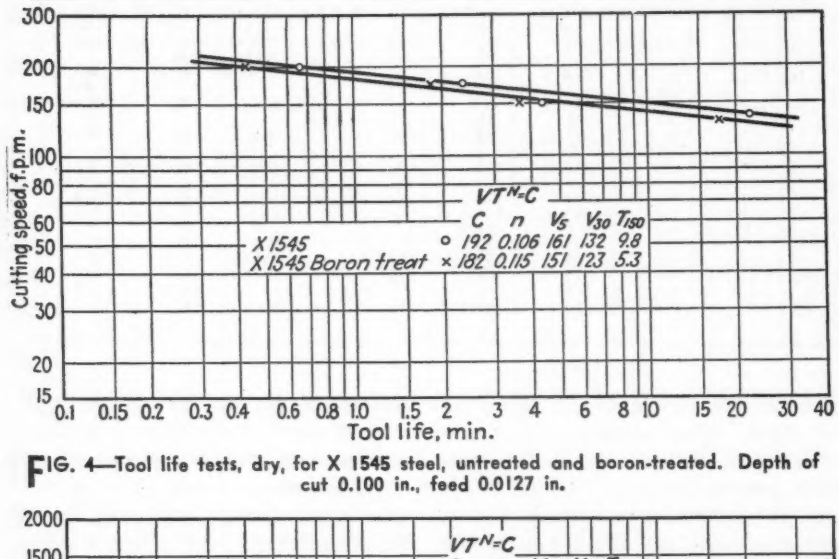


FIG. 4—Tool life tests, dry, for X 1545 steel, untreated and boron-treated. Depth of cut 0.100 in., feed 0.0127 in.

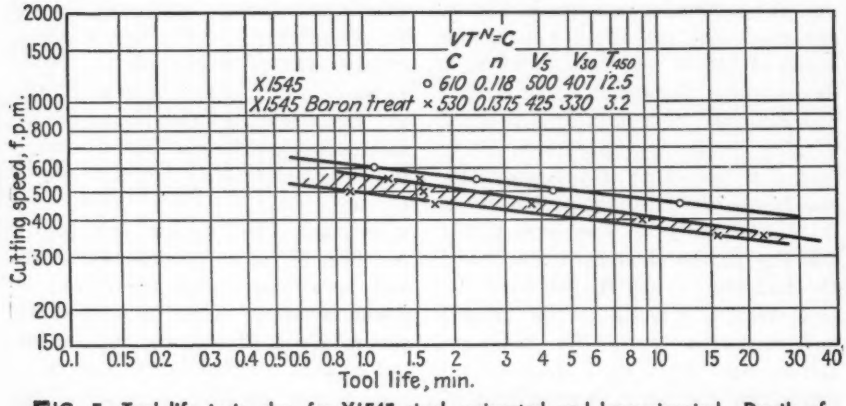


FIG. 5—Tool life tests, dry, for X1545 steel, untreated and boron-treated. Depth of cut 0.100 in., feed 0.00077 in.

for the un-treated steel bars. The treated bars gave very erratic results, so that instead of indicating a single line, they indicate a band shown cross hatched. It is clear, however, that all points and the whole cross-hatched area of the data for the boron-treated steels are below those data for the un-treated steel. Consequently, it is inferior from a machining point of view.

"It was observed that the chips for the boron-treated steel seemed to be more continuous and not so well broken up as the untreated steel. The chip coils from the boron-treated steel were larger than those of the untreated steel when turned at the same speed. At 200 ft. per min. speed and a feed of 0.0127 in., the untreated steel gave 4 in. diameter coil chips until preliminary failure, and then small ¼ in. diameter short coils having a light blue color. The finish was fair but torn.

"For the treated steel the chips were from ¼ in. to ½ in. diameter in coils 1 in. long near the end of the test, but at the start they were very long. For a speed of 175 ft. per min. the untreated steel gave 3 in. diameter coils for about 1 min., and then small coils ¼ in. to ½ in. in diameter and 1 in. long of a light blue color. The finish was fair, being burnished before preliminary tool failure, but good thereafter.

"The untreated steel gave large 4 in. diameter coil chips at the start of the cut, but gray-blue coils from ¼ in. to ½ in. in diameter and 1 in. long after the tool was cupped. At 150 ft. per min. the untreated steel gave ¼ in. diameter coiled chips of a dark blue color, well broken up. The treated steel gave ½ in. diameter coils at first, but small broken-up chips as the tool wore. For a speed of 135 ft. per min. the untreated steel gave a uniform finish with small diameter blue, well broken-up chips from ⅛ in. to 1/16 in. in diameter. Dark blue broken-up chips ¼ in. in diameter resulted from the treated steel at this speed."

The hardenability of this free machining steel was increased 31 per cent by the addition of boron. This contrasted with a 21 per cent increment in the computed hardenability.

As was anticipated, the machinability of the steel was impaired by the addition of boron. This impairment was about 5 per cent in the regular test and went as high as 15 per cent in the high speed light cut test.

Welded Fragmentation Bombs

AN output of 8000 fragmentation bombs per day is being achieved at the Coolerator Co., Duluth, Minn., due to an ingenious adaptation of special welding jigs and the use of large electrodes which help speed up the work. The bombs, 3⅛ by 3⅛ by 4 in., are about the size of a baseball but require approximately 11½ in. of arc butt welding per unit to fabricate.

The bomb parts, in various stages of manufacture, are shown in Fig. 1 with the all-welded and painted unit ready for loading and installation of fuse control and release, appearing in upper right corner. The two pieces comprising the bomb casing or shell are stamped and draw-formed from ¼-in. thick blanks of WD 1010 steel. (Fig. 1, left.) The two cupped and die-beveled parts are butted together, spot welded, then placed on a roller conveyor which carries them to the welding operators in a continuous flow.

The operator positions the unit on a horizontal welding fixture, Fig. 2, which is rotated by the operator's left hand. As the work is revolved the electrode is held in a constant position for best down hand welding.

By changing from 3/16-in. to 7/32-in. electrodes, a welding speed approximately 15 per cent greater was effected. The rods used are of AWS E6012 classification.

After welding, the bombs are moved to a second conveyor which carries them through a water sprinkler for cooling, then to grinding and buffing stands. From here the work travels to the pressure testing jig, Fig. 3, where the bomb is placed in a cradle arm and held rigidly just below water level, while the operator lowers the pressure nozzle which is equipped with a rubber tip to effect an air and water-tight fit. About 15 lb. pressure is applied. The negligible number of "leakers" encountered are easily reclaimed by rewelding.

A battery of eight 300 amp. Lincoln welders are used on this job of fabricating the 4-lb. fragmentation bombs.

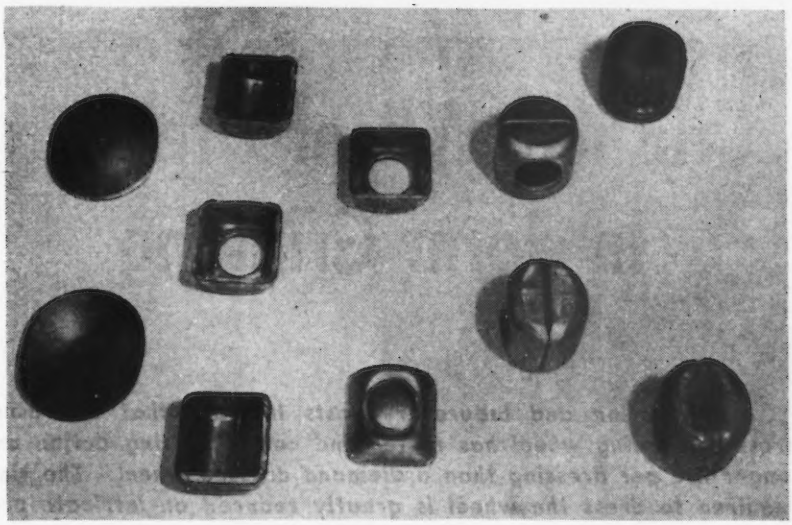


FIG. 1—Steel parts for welded fragmentation bomb in various stages of manufacture. Completed unit is shown at upper right. The ¼ in. blanks are seen at the left.

FIG. 2—Welding bomb on rotating spindle fixture. Finish welded units in foreground show solid weld around circumference. Central exhaust system removes fumes through duct over work.

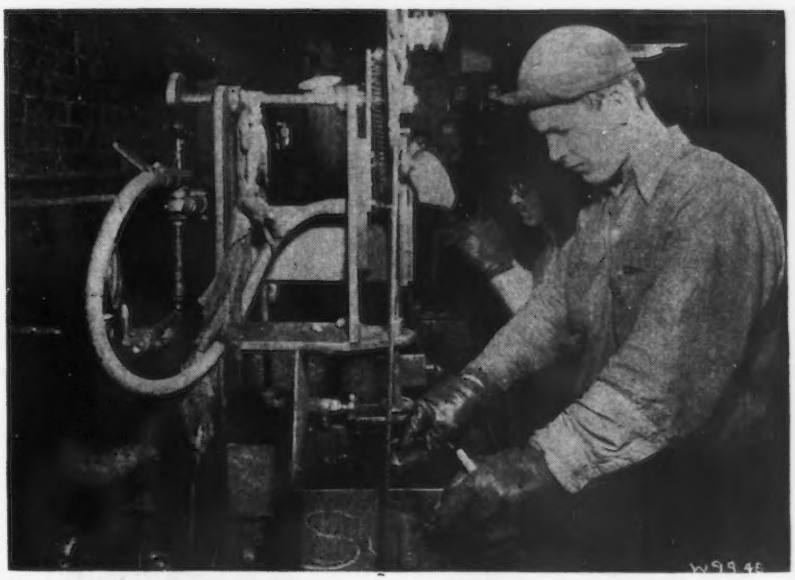


FIG. 3—Pressure testing apparatus used to assure air and water tight construction of bombs.

Photos by courtesy of Lincoln Electric Co.

Crushed Wheel Dressing In Form Grinding

. . . Production and laboratory tests indicate that a crusher dressed grinding wheel has faster and cooler cutting action and longer life per dressing than a diamond dressed wheel. The time required to dress the wheel is greatly reduced on intricate profiles, due to the simplicity of the dressing operation.

o o o

By RICHARD Y. MOSS
Production Engineering Manager, Sheffield Corp., Dayton, Ohio

o o o

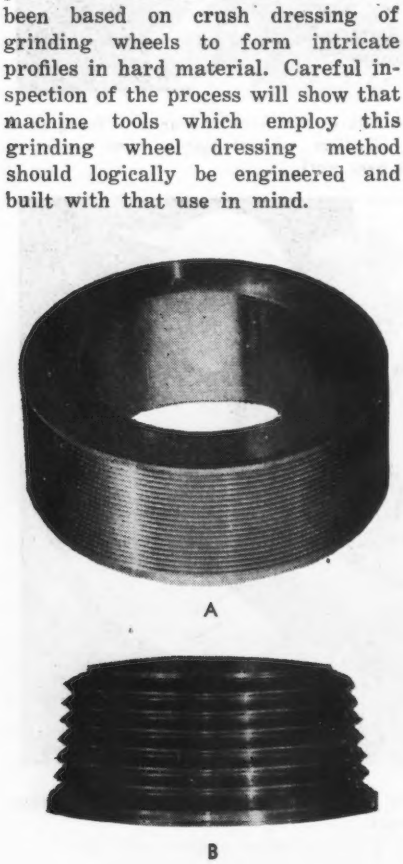
LIBERTIES in design of precision products by today's engineers are made possible by means of an abrasive wheel dressing for the grinding of profiles not widely applied in this country prior to 1944. Final design and processing of components of critical combat items have been based on crush dressing of grinding wheels to form intricate profiles in hard material. Careful inspection of the process will show that machine tools which employ this grinding wheel dressing method should logically be engineered and built with that use in mind.

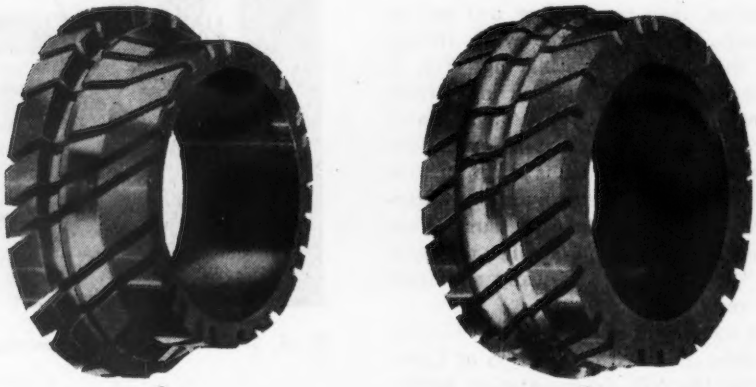
Crusher or roller dressing is a method of producing a formed contour or a flat face on the periphery of a grinding wheel which offers particular advantages over diamond truing in many production and toolroom applications. Essentially this method of dressing entails rolling an accurately made annular form into the surface of a grinding wheel with the two held in sufficiently rigid mounting relationship to each other to prevent errors of deflection.

A wheel dressed by this method may be used in any application where grinding wheels are logically applied and in some cases where grinding wheels have not previously been commercially usable. The novelty of dressing abrasive wheels by crushing dissipates readily with the realization that the effective hardness of a grinding wheel is largely a result of its high operating surface speed. In crushed dressing the peripheral speed of the wheel is from 250 to 300 ft. per min.

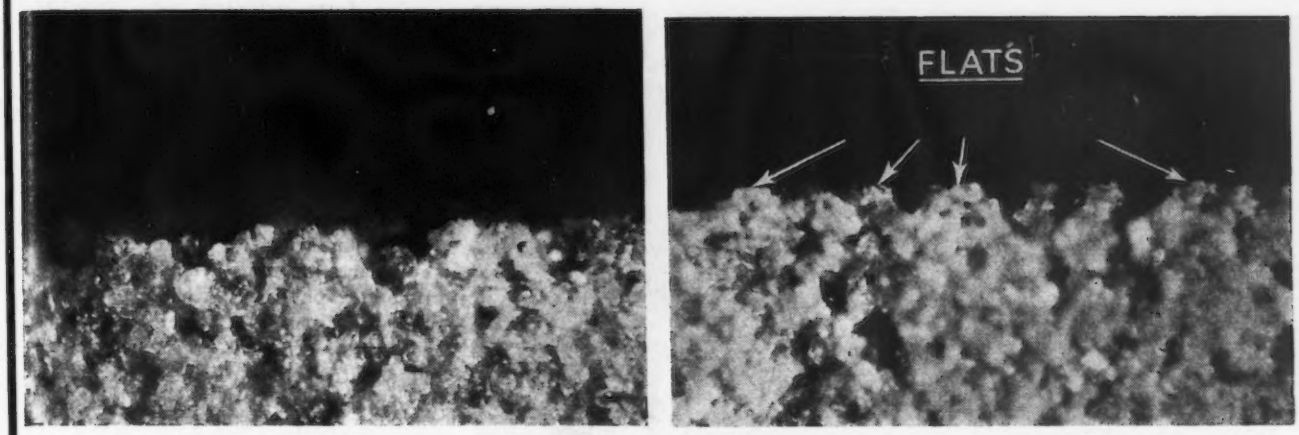
This method of abrasive wheel dressing has been extensively used in England and Continental Europe and to a lesser extent in this country in recent years. At this writing, one machine tool available as standard on the American market has been engineered specifically for production with crusher dressed wheels. It was made by the Sheffield Corp. which also has other machine tools in process and design for manufacture.

Careful examination of the basic elements of wheel crushing practices shows that the method has very few limitations at this development stage. In many types of work, it already presents a much faster and less expensive means of performing a grinding operation. The volume produc-





FIGS. A, B, C, D.—(A) Standard 60 deg. thread form crusher without coolant grooves. Removing first thread ribs on crusher permits removal of first imperfect thread on part during grinding of thread. (B) Special crusher used to dress wheel for surface grinding turbine blade root form. (C) Special crusher to dress wheel to grind form on can sealing roll. (D) Special crusher to dress wheel to grind ball race.



(LEFT) In crush dressing, grains are broken away instead of cut, leaving sharp edges. (Right) In diamond dressing, grains are often cut, resulting in numerous flat surfaces.

tion of some intricate parts is possible only with use of this dressing method.

A wide variety of both production results and laboratory tests shows that a crusher dressed wheel has faster and cooler cutting action and longer life per dressing. The time required to dress the wheel is greatly reduced on intricate profiles, due to the simplicity of the dressing operation.

Grains Left Sharp

Microscopic examinations of wheel surface structure after crusher dressing reveal the presence of a greater number of sharp cutting points or edges than on a diamond dressed wheel. Examination of the surface of the same wheel after diamond dressing reveals the presence of flats which may be truncated grains or grainbond masses. This condition may explain the experience frequently noted in production work that a crusher dressed 220 grit wheel will cut more freely than a diamond dressed wheel of 150 grit on the same application.

The absence of these flats on the periphery of a crushed wheel may also have the effect of increased chip clearance and cutting tool relief. This belief is supported by measurements which show pressure of a crusher dressed wheel on the work to be less than half that exerted by a diamond dressed wheel under otherwise identical circumstances.

Reduction of heat generation at the area of wheel and work contact permits grinding forms or threads from the solid in hardened stock without the softening effect frequently encountered in such operations.

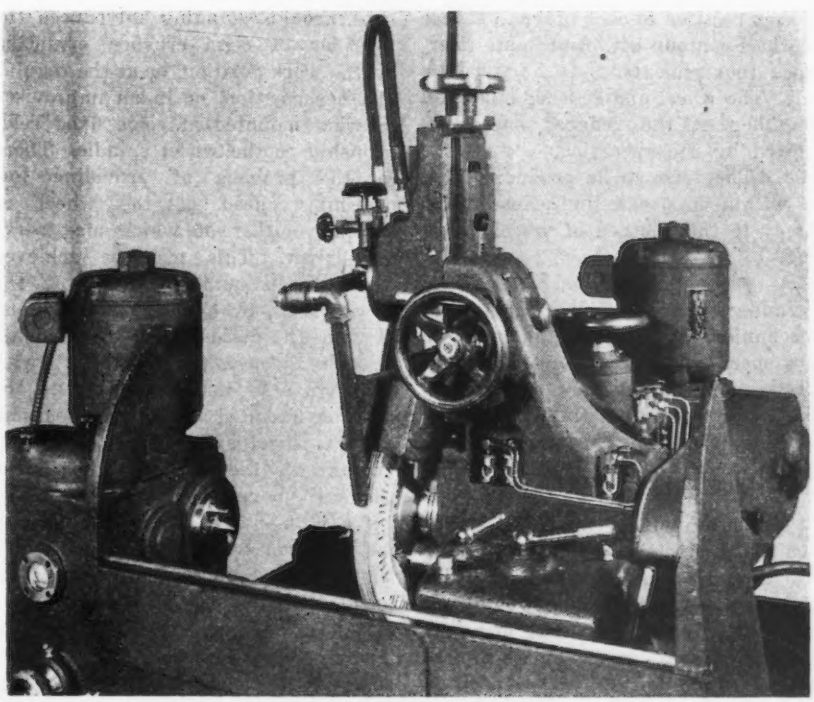
Choice of Wheels

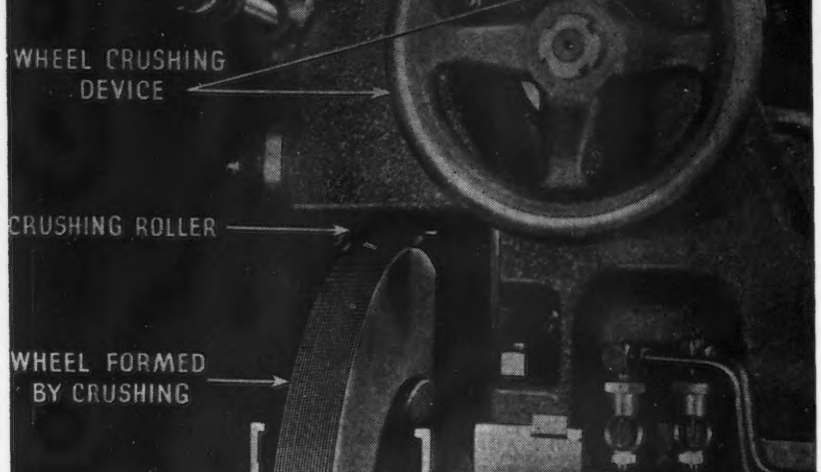
At this writing, the best results in crusher dressing have been obtained with aluminum oxide wheels of fine to very fine grain size, medium grade and structure, with vitrified bond. Limited experience indicates that a change to silicon carbide grain with other wheel specifications remaining approximately the same can be made where that abrasive is required. The resilience of plastic and rubber bonds at present precludes their successful use with crusher dressing.

The grinding wheel face width is governed primarily by the ability of the wheel spindle to mount such a wheel and take a wide facing cut without distortion. It is likely in any case that the pressure exerted to deflect the wheel spindle during the crushing operation will exceed the pressure of the wheel on the work during the grinding cycle; the amount of this pressure can be measured, but will vary with wheel and crusher diameters, wheel width and hardness, profile being impressed on the wheel, use of coolant, and other lesser factors. It is therefore necessary for the user to determine, sometimes by experiment, whether a desired wheel face width can successfully be used in the application of this dressing method to a machine not specifically constructed for such use.

In many cases a wide wheel face will require longer delivery time from the wheel manufacturer who may have a problem of obtaining uniform density on a wide-face wheel of approximate specification. As a result

VIEW of Sheffield thread and form grinder, showing work head and wheel head. Note rigid mounting of crusher slide with respect to wheel spindle. Auxiliary driving motor for crushing speed of wheel spindle may be seen in background. Upper portion of wheel guard is removable for crushing operation.





CLOSE-UP of crusher roll and wheel in dressing engagement. The grinding wheel serves as driver at a speed of approximately 300 surface ft. per min.

of variations in density, dressing time would not be appreciably influenced, but different rates of wheel breakdown may require more frequent dressing to maintain product tolerance.

A variety of simple approaches may be taken to crush-dress abrasive wheels, using standard grinding machines suited to flat or circular work. Factors which are readily determined as basic include the following:

1. The wheel must be reasonably well suited to crusher dressing.

2. The wheel spindle and crusher must be sufficiently free from deflection in relation to each other to assure a wheel contour within ultimate tolerance requirements.

3. The wheel and crusher must roll together at the reduced speed required by the operation.

4. The form to be produced must be within the profile limitations which apply to this method of wheel dressing.

A production thread and form grinding machine with the entire mechanism for crushing, including a low speed wheel drive for the crusher dressing cycle, built as an integral part, offers an interesting comparison with a typical converted machine tool.

Multi-Rib Thread Grinder

This machine is primarily designed for the production grinding of standard thread forms—American, British, or metric—with crushed multi-rib grinding wheels. The width of wheel, up to 1¼ in., can be suited to the length of thread to be ground. In hard or soft steel or non-ferrous material it provides a means of grinding the full thread form in the time required to plunge the wheel to depth, ordinarily one-fourth to one-third revolution of the work, and then make one full revolution of the work at form depth. In comparison with conventional single-rib thread grinding this provides the speed and cool cuting of the crushed wheel, as well as the forming of as much as 1¼ in. thread length in slightly over one revolution of the work.

Conversion of a conventional single-rib thread grinder to crushed multi-rib through grinding introduces the problem of rigid crusher mounting at the work position, or at the regular dresser position, or in an improvised bracket mounted at some fixed relationship to the wheel spindle. There is the problem of providing low crushing speed of the wheel or crusher, either of which may serve as driver. This may be achieved through an auxiliary drive on the wheel head, by hand cranking, or by driving the disconnected wheel on its spindle through the workhead (with lead traverse disconnected) with the crusher mounted at the work position. If the wheel spindle and other elements of the machine have the strength to carry a wide face wheel on a plunge cut, usable results may be achieved by any approach which employs a combination of the elements listed.

The same specific crusher dressing grinding machine mentioned above offers facilities for a variety of annular form grinding jobs, ranging from reproduction of crusher rolls for its own use to a variety of circular form tools, annular thread forms for gages, diesel injector plungers, parts for hydraulic mechanism and numerous others. The same features of rigid wheel spindle and rigid crusher mounting make for maximum accuracy of wheel contour and parts ground. Production advantages are obtained with the part contours preformed, but on shallow contours the economy of such practice is doubtful since the rate of stock removal is such that the full form can be ground from solid stock in a comparatively short cycle.

Any standard cylindrical grinder may be converted with varying degrees of success for using crusher dressing for annular work. The same elements mentioned in regard to thread grinding must be observed in such a conversion; normally it is to be expected that greater operator skill will be required on the converted machine, and that any considerable degree of improvisation to crusher-dress will reduce accuracy of result.

The conversion of a standard grinding machine to crusher dressing presents two major problems in any application: It is necessary that comparative rigidity of crusher mounting be obtained; it is also necessary to determine whether the reduced speed used in crushing will be obtained by having the crusher roll drive the wheel or having the wheel drive the crusher. Wherever possible, it is preferable to have the wheel drive the crusher for the reason that torque to rotate the freely mounted crusher is ordinarily less than is needed to rotate the wheel spindle assembly and drive.

Elements of Crusher Design

Crusher rolls for multi-rib thread grinding are made with annular ribs to the exact thread profile desired. The number of ribs on the crusher may exceed the width of wheel face, permitting the crusher to be used in two positions and thus increasing its useful life.

Crusher rolls for annular forms are subject to much greater variety. Observation of the action of crusher rolls rolling with wheels in dressing and examination of rolls and wheels for wear afterwards leads to establishment of certain practical limits of design for such rolls. These limitations may make it economically desirable to use several crushers for production of one wide form or to leave stock in crushing for subsequent removal with a flat wheel on straight portions of the form. No simple rules

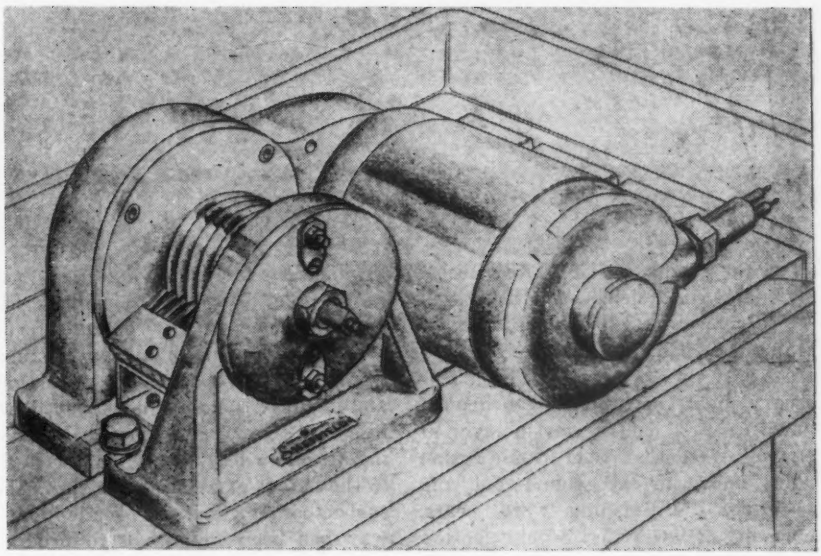
can be set to control these choices, and in some cases actual trial is best. The factors listed in succeeding paragraphs are based on actual experiences and are meant to point out those elements of design which influence crusher and wheel life most.

The crusher diameter most commonly used is around 3 in. A smaller diameter will operate with less pressure and offer less wearing surface. A larger diameter will operate with greater crushing pressure and offer greater wearing surface. Depending on probable service requirement, the rolls may be made of soft or hard carbon or alloy tool steel. High speed steel is a commonly used material.

Limitations Discussed

A comparatively large difference in two diameters of the same crusher profile produces similarly different diameters in wheel profile. The wheel and roll running in full engagement will probably *roll* on one of the diameters and slip slightly at the other diameter. In some cases, it may be desirable to make two crushers or a crusher in two sections of profile for use in two positions to reduce crusher wear.

A square shoulder on the part and crusher, and similarly on the wheel, presents a surface which has only a wiping rather than a crushing action in the engagement of the two members. The frequent requirement for grinding an annular slot with both sides exactly 90 deg. to the axis is troublesome with both crusher and diamond dressing because the wheel must be cut away to near the depth of the slot at each dressing in order to restore the width of rib required on the grinding wheel.



SKETCH of a motor driven crushing roll unit for application to reciprocating table type surface grinders.

The minimum fillet and minimum external radius which are commercially practical in grinding with a crusher dressed wheel are around 0.003 to 0.004 in.

In general, any production form which permits use of crusher dressing within the three limitations cited above can be ground with the use of a crusher dressed wheel held to commercially close limits without the need for added finishing operations on the work. Flat or annular forms may be produced with equal effectiveness. Retouching to produce clearance angles on form tools, straight outside diameters on circular forms, and the like may be desirable in some applications.

Many potential applications for crushed wheel grinding await development of machines in ranges of capacity suited to their problems.

Diamonds Impregnated in Carbide

Speed Up Wheel Recess Dressing

WHEEL dressers made with small commercial diamonds set into a matrix of Carboloy cemented carbide have made possible a considerable saving in time and money at one of Detroit's largest aircraft engine plants, where they are being used to true-up recesses in finish grinding wheels employed to grind the o.d. on aircraft cylinder sleeves.

When a conventional single diamond dresser was used for the recessing operation—which is necessary in order that the grinding wheel may produce a sharp corner at the bottom of the cylinder sleeve's flange—the holder had to be ground flat and the diamond lapped so the stone would perform the dishing-out operation correctly without the holder touching the edges of the recess when swinging it through an arc.

The Carboloy diamond-impregnated

dresser, on the other hand, contains diamond particles distributed throughout the matrix, thereby insuring that at least one or more of the stones will be in contact with the grinding wheel at all times as the holder is swung through a small arc. Moreover, new cutting faces are presented to the abrasive wheel as layer after layer of diamonds are reached and exposed, due to the gradual wearing away of the carbide matrix. Hence, no lapping and no remounting are needed.

Reports from the former automotive manufacturer's grinding department also indicate that these dressers lower the cost per wheel dressing on the average job and successfully stand abuse which would ruin a single diamond dresser.

▲ ▲ ▲ New Titanium Steel For

IN the production of white vitreous enameled articles such as stoves, refrigerators, dish pans, etc., in which the enamel is fused on a sheet-steel base, it has generally been necessary until very recently to deposit and fuse first on the steel a layer of enamel of comparatively high fusion point, known as the ground coat, and to apply the finishing white coats, normally of lower fusion point, on top of it. The ground coat has been necessary chiefly for two reasons, first to promote adherence between the glassy enamel and the steel, and second to prevent the appearance of blisters, black specks and other defects on the finished surface. Adherence is ordinarily accomplished through the medium of cobalt oxide in the ground-coat composition, which promotes the formation of the correct oxide coating on the steel to dissolve in, and unite with, the enamel glass. This oxide, however, gives a dark blue color to the ground coat, which of course is of no help in forming the pure white finished surface obtained by subsequent enamel coats.

Blistering of vitreous enameled surfaces on steel is chiefly due to the evolution of gas from the steel through the enamel while it is cooling from the fusion temperature, but the exact nature and source of the gas have not been unanimously agreed upon. One explanation is that it results from a reaction between carbide in the steel and oxide in the enamel, producing carbonaceous gases, but other theories involving hydrogen have been proposed. By fusing a ground coat on the steel first at a comparatively high temperature, most of the gas is generally evolved at that time, so that subsequent layers of the white cover coats, fused at a lower temperature, may solidify free from gas. In this way the use of a ground coat usually protects the cover coats of white enamel from blistering or "reboiling," and without the ground coat smooth white enamel coatings could not previously be obtained.

If pure iron sheets entirely free from carbon were used as a base for vitreous enamels the source of many defects due to the evolution of gases would probably be eliminated, and one reason for the necessity of a ground coat might no longer exist. It is possible, however, to convert the carbon in steel to a more stable form, so that it does not react with oxides in the enamel coatings to form gas and blisters. This has now been done, in actual commercial practice, by adding titanium to the steel in the ladle to the extent of at least five times the carbon content, and steel made in this way has been found not to produce the usual boiling or blistering of enamel coatings fused on it. This presumably is because all the carbon in such steel is combined as titanium carbide, which is more stable in the enameling cycle than iron carbide.

Theoretically four parts by weight of titanium are required to combine with one part of carbon, but in practice more than this proportion of titanium is required because some of it may occur as oxide, nitride or sulphide. With 4.5 times as much titanium as carbon, or more, steel (or iron) is found to acquire several advantageous properties. It does not then have a well-defined yield point, even in the annealed condition, and is not susceptible to any kind of strain-aging. This has been fully reported in a paper* and since the publication of that paper, which dealt exclusively with laboratory melted steel in bar form, the titanium steel has been made with no particular trouble at several steel mills on a fully commercial scale, and rolled into entirely satisfactory sheets for enameling.

Several methods have been used successfully for making the steel in basic open hearth plants. All are based on complete deoxidation of the steel with aluminum so as to prevent excessive loss, by oxidation, of the titanium added. One method involves adding a low-carbon titanium alloy, containing aluminum, to the steel as it is being poured into the ingot molds. This is best done in a large ingot, where the steel can be poured fast with considerable turbulence in the mold. The alloy may be added by means of a trough resting on the edge of the mold, and the addition should be made gradually while the mold is filling. There must be sufficient turbulence to mix the cold alloy thoroughly into the steel, since if it floats on the surface it will be washed to the sides of the ingot, giving poor recovery and serious defects on the rolled slabs.

A better method is to add the titanium in the ladle. To obtain good recovery of titanium in this way, it is necessary to deoxidize the steel first with aluminum (silicon will not do), and to prevent or minimize contact of the titanium steel with the oxidizing basic open-hearth slag. This is most

*"*Strain Aging of Killed Low-Carbon Steel, with Particular Reference to the Effect of Titanium," published in 1943 by the A.S.T.M. in Vol. 43 of the Proceedings, P. 521.*

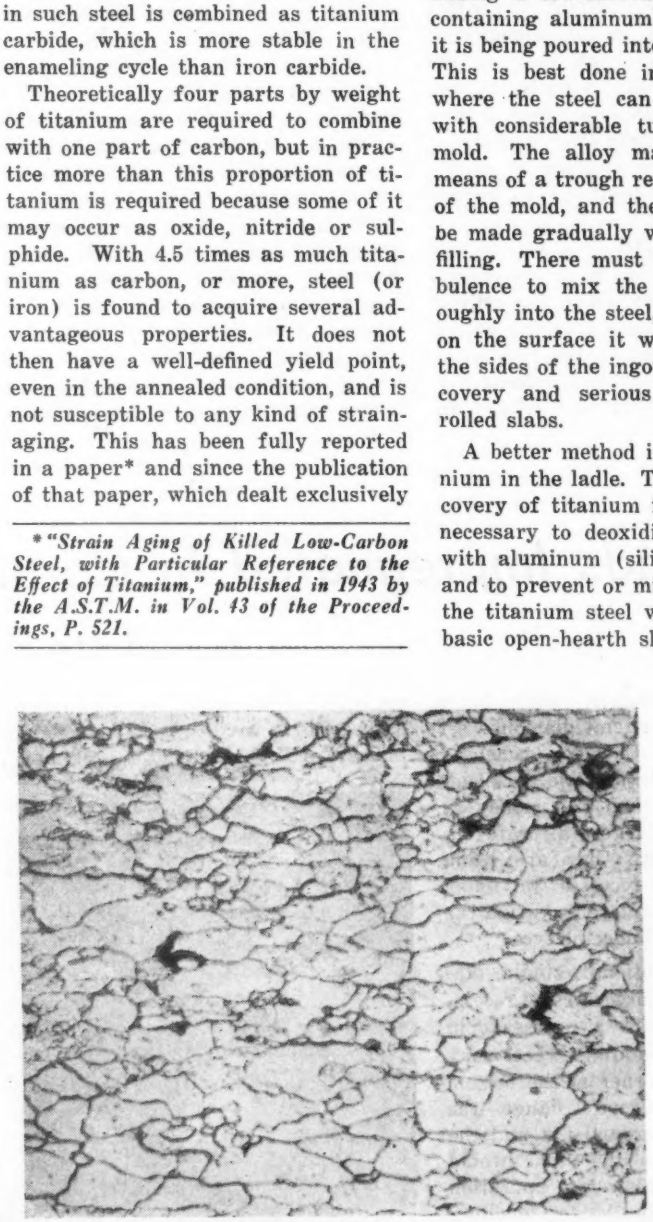


FIG. 1—Cross-section of titanium steel sheet with 3.3 titanium-carbon ratio, etched first with nital to attack the ferrite grain boundaries, then with boiling alkaline sodium picrate to blacken cementite. At 500 diameters.

Vitreous Enameling ▲ ▲ ▲

By G. F. COMSTOCK
and
E. WAINER
Titanium Alloy Mfg. Co., Niagara Falls, N. Y.

. . . By converting carbon in steel to a more stable form with heavy additions of titanium it does not react with oxides in enamel coatings to form gas and blisters. With certain precautions one-coat one-fire finishes are practicable.

readily accomplished by tapping the heat in the usual way into one ladle, where it is deoxidized with aluminum, and then pouring it through a large nozzle into a second preheated ladle where the low-carbon ferrotitanum is added. The stream from the first ladle should be moved around while filling the second one, so as to wash the ferrotitanium, which is thrown in in bags, below the surface as soon as possible. No slag should be permitted to flow into the second ladle, but a lime cover or some similar material should be used on top of the steel for heat insulation.

If only one ladle can be used, the preliminary aluminum deoxidation can be effected in the furnace spout, with the ferrotitanium added in the ladle before the slag starts to flow, and the slag should then not be permitted to run out on top of the ladle, which is taken away from the spout when the slag appears. Some cold powdery material such as lime is then thrown over the ladle for heat insulation and to chill and dilute what little slag flowed on the steel before the ladle could be moved. The steel should be very hot when tapped, to dissolve the ferrotitanium quickly, and the tap-hole should be small so that the slag does not start to flow too soon.

Titanium alloy steel made by any of these methods will, of course, be fully killed, and the ingots may be expected to be deeply piped unless hot-tops are used as in normal killed-steel practice.

High Titanium Recovery

The recovery of the added titanium in the finished steel has varied between 69 and 87 per cent by these three methods, with the double-ladle process giving the best results. The best titanium alloy to use is probably the well-known 40 per cent alloy, containing about 40 per cent titanium, 9 per cent aluminum, 3 per cent silicon and 0.05 per cent carbon. Other available alloys either have a higher melting point and dissolve in the steel slower, or are lower in titanium so that a larger addition is required. The amount of titanium to be added to a given heat depends on the carbon content, since this steel must have at least 4.5 times as much titanium as carbon. This minimum limit is critical, for if the titanium-carbon ratio is even slightly low, the quality may be no better than if no titanium at all had been used. On the other hand, if there is an excess of titanium, even up to a titanium-carbon ratio of 10 or 12, the quality is not materially affected, the only difference being a slight increase in strength and stiffness. It is safer then to aim for an excess of titanium rather than to risk wasting what titanium is used by having a slight deficiency.

It seems to be most economical to make this steel with about 0.04 per cent carbon. This requires at least 0.18 per cent titanium, or preferably about 0.20 per cent to allow for slightly higher carbon in some parts of the heat. Assuming 70 per cent recovery, 1450 lb. of 40 per cent ferrotitanium would be needed for a 100 net ton heat. Although this may seem like a pretty large ladle addition, it has been used repeatedly by the methods outlined above, or even exceeded, with no failures to date. If lower carbon than 0.04 per cent is aimed for to save titanium, the time and wear of the furnace may prove more costly than the alloy saved. Aluminum for preliminary deoxidation of these titanium heats has been used to the extent of about 3 to 5 lb. per ton. Silicon should be kept low, or not more than what is acquired from the ferrotitanium. Manganese has generally been used to the extent of 0.35 to 0.45 per cent, but it could probably be lower since titanium will serve the purpose of manganese in preventing hot-shortness due to sulphur. The recovery of the manganese added is practically complete in this very highly deoxidized steel.

Structurally this steel consists exclusively of ferrite and titanium carbide, which occurs as fine angular crystals scattered indiscriminately through the ferrite grains. The ferrite probably differs from that of ordinary low-carbon steel or ingot-iron, however, in holding practically no carbon in solid solution, titanium carbide being very much less soluble than iron carbide in ferrite. As processed by usual sheet or strip mill methods this steel may tend to be rather coarse-grained, but by normal-

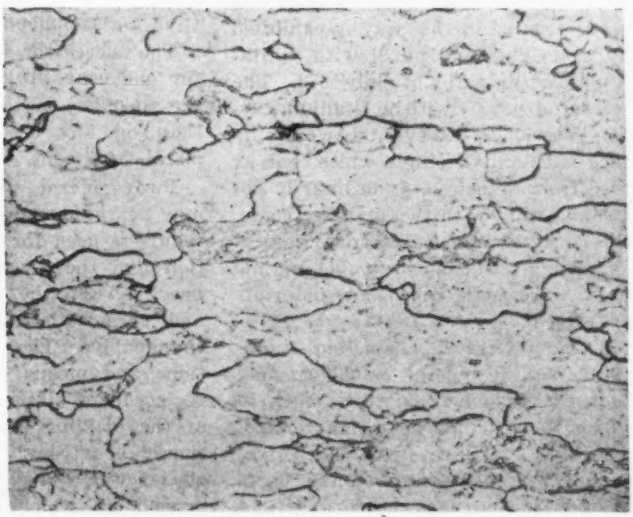


FIG. 2—Cross-section of titanium steel sheet with about 8 titanium-carbon ratio, etched and magnified same as Fig. 1, showing coarser ferrite grains and no cementite.

izing at not over 1650 deg. F. the ferrite grain size may be held to No. 7 or finer. Fig. 1 and 2 herewith illustrate the difference in structure between two steel sheets, made from the same heat and processed in the same way, but with different titanium contents. One with only 3.3 times as much titanium as carbon is seen to contain some massive cementite as well as ferrite, while the other with a titanium-carbon ratio of about 8 shows only ferrite grains, which are coarser than in Fig. 1.

Tensile tests of these cold-rolled sheets after aging gave the following results, each averaged from eight specimens:

Titanium-carbon ratio	3.3	8.1
Yield strength, 0.5 per cent offset, lb. per sq. in.	50,000	37,075
Tensile strength	60,400	51,075
Yield ratio, per cent	82.9	72.5
Elongation, per cent in 2 in...	25.9	32.2

The load-deformation curves obtained in testing these two steels are illustrated in Fig. 3, where the characteristic absence of a definite yield point in the higher titanium steel is obvious. These specimens were aged for about five weeks at room temperature, after the final temper-pass at the mill, as well as for an hour at 450 deg. F. before tensile testing.

The low yield strength, gradual yielding and high ductility of the higher titanium steel are marked advantages for cold forming. This was mentioned in the discussion of the ASTM paper referred to above (Proc. ASTM., Vol. 43, p. 544), where the superior drawing quality of the titanium steel was reported. The drawn cups appearing in Fig. 4 illustrate the difference in drawing properties of the two steels, with less than, or more than, the critical titanium-carbon ratio, as revealed by the Boulger-Dahle cup-drawing test. The latter steel, illustrated at the left side of Fig. 4, formed perfect 1-in. cups from disks 2 in. and 11/32 in. in diameter, while the other steel failed with disks of as small diameter as 2 in. and 3/16 in. The Rockwell B hardness of these sheets was about 65 for the lower-titanium steel containing some cementite, and about 51 for the higher-titanium steel with no carbon not combined with titanium.

The very excellent drawing quality of this new titanium sheet steel has been amply confirmed by numerous other tests made by drawing difficult shapes with sheets from various sources. This is one of its most useful characteristics as a base for enameling, since many enameled articles must first be cold-drawn, and the best cold-drawing or deep-stamping steel previously known is not of particularly good enameling quality. The titanium steel does not require any special heat treatment or processing to provide good drawing properties, since it has low yield strength, no definite yield point and high ductility in practically all conditions.

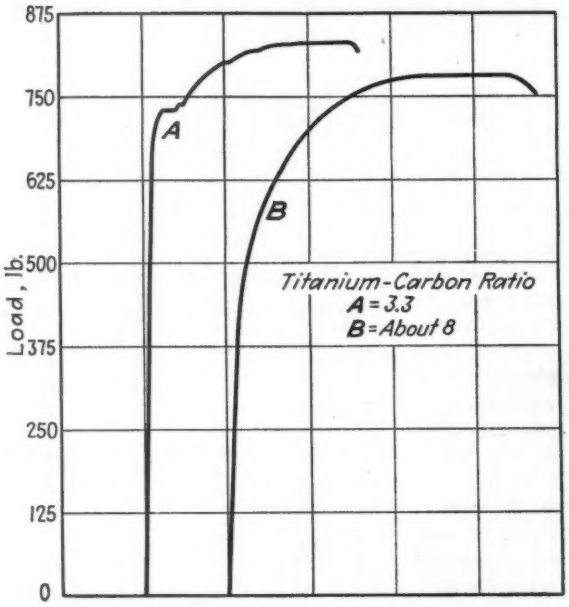


FIG. 3 — Typical load - deformation diagrams of titanium sheet steels. Both specimens aged at 450 deg. F. after rolling.

Another property of this new steel which is useful in enameling is its stiffness or resistance to sagging at enameling temperatures. Therefore, thinner gages of the titanium steel can be used for large enameled shapes, without risk of excessive deformation when the enamel is fused.

The difference in enameling quality produced by an increase in titanium content to an amount exceeding the critical titanium-carbon ratio is illustrated by the sample enameled panels in the background of Fig. 4. These were produced by firing a white cover-coat enamel directly on the steel, without any ground-coat. The blistering characteristic of the results with all previous enameling steels when treated in this way is exhibited by the right-hand panel with a titanium-carbon ratio of only 3:3. The left-hand panel, with a titanium-carbon ratio of 8, however, shows a surface with only a single white coat as free from defects as is ordinarily obtainable only with two or three coats. Obviously an important advantage in enameling costs is obtainable in this way, since both time and materials are saved.

From a vitreous enameling standpoint, the steel described above may be used for one coat white work in which the ground coat is eliminated, providing certain precautions are taken. The processing of the parts to be enameled must be correct, and the pickling and enameling procedures also require careful control.

Metal Finishing Operations

If possible, all metal finishing should be completed before pickling. The following metal finishing operations do not affect the enameling properties of the titanium steel adversely with respect to black specking and blistering:

(1) Deep drawing.
(2) Metal finishing with disk grinder.
(3) Spot welding or butt welding.
(4) Roll welding or seam welding.
(5) Metal finishing with metal finish file.

Metal finishing operations which adversely affect the surface of enameled ware are:

(1) Electric arc welding with rod.
(2) Metal finishing with disk grinder.
(3) Heavy gas welds especially when run too hot or too long.
(4) Any metal finishing causing deep scratches.

Sand blasting is particularly efficient in increasing bond and eliminating surface contamination which might result in defects in enameling. It is a recommended practice.

The success or failure of the stock for one coat work depends more on the adequacy of the pickling practice than on any other feature of the metal treatment.

Two general pickling procedures may be recommended. The first procedure is used for laboratory evaluation and the second for commercial practice. With proper equipment and care both may be used interchangeably. The necessary precautions and means of recognizing defects will be discussed after detailing of the pickling practice. One point should be strongly emphasized: The efficiency of any pickling practice will depend on the character and nature

of the rinsing between baths. All residual salts due to pickling must be removed.

(A) Laboratory Practice

(1) Degrease by soaking in carbon tetrachloride for 3 to 5 min.
(2) Air dry.
(3) Bath: 150 c.c. N Brand (Philadelphia Quartz) sodium silicate plus 150 gm. of Na_2CO_3 in 3 liters of water; 5 min. with bath boiling.
(4) Rinse a few seconds in cold running water.
(5) Hot rinse at 160 deg. to 170 deg. F. for 30 sec.
(6) Pickle for 5 min. and 140 deg. F. in bath made as follows: 100 c.c. of 66 deg. Be H_2SO_4 in 3 liters of water.
(7) Rinse a few seconds in cold running water.
(8) Hot rinse at 160 deg. to 170 deg. F. for 30 sec.
(9) Nickel strike. Bath consists of 60 gm. of nickel ammonium sulphate salt and 15 gm. of boric acid, all dissolved in 3 liters of water. Flash for 3 min. at 176 deg. F. (80 deg. C.).
(10) Cold water immersion rinse: 30 sec. in water slightly acidified with H_2SO_4. pH = 3.0.
(11) Neutralize by immersion in bath made up as follows: 10 gm. NaCN in 3 liters of water. Treatment is 2 min. at 150 deg. to 160 deg. F.
(12) Air dry after neutralization without washing or rinsing.

(B) Shop Practice

(1) Organic degreaser: trichlorethylene or carbon tetrachloride; 5 min. treatment.
(2) Air dry.
(3) Alkaline cleaners. Any soap free alkaline cleaner. Mixtures of Na_2CO_3, Na_2SiO_3, and trisodium phosphate recommended. Bath: 12 oz. per gal., boiling, 6 min.
(4) Alkaline cleaner. Same bath as in (3) at 9 oz. per gal., boiling, 6 min.
(5) Two hot water immersion rinses 25 sec. to 30 sec. in each tank, 160 deg. to 180 deg. F.
(6) Cold water immersion and spray rinse 30 sec.
(7) Sulphuric acid pickle, 5 min., 6 per cent acid by weight. Temperature, 140 deg. to 150 deg. F.
(8) Cold water immersion and spray rinse. 30 sec.
(9) Nickel strike, 5 min.; 1½ oz. per gal. single nickel salts plus ¼ oz. boric acid per gal. Temperature, 160 deg. F.; pH 4.0 to 4.5. Nickel deposited 0.07 to 0.08 gm. per sq. ft. Tank should be kept clean by continuous filtering if possible.
(10) Cold water immersion rinse, 30 sec. in water slightly acidified with sulphuric acid; pH = 3.0.
(11) Cyanide neutralizer, 3 min.; ¼ oz. NaCN per gal. at 160 deg. F.
(12) Borax neutralizer, immersion and spray rinse—¼ ounce borax per gallon—30 sec. at 160 deg. F.
(13) Air dry.

In subsequent enameling, two defects may occur which are due to pickling practice. A common defect is an extremely fine black specking which generally occurs uniformly over the entire surface of the sheet. A second defect is a localized, generally quite coarse, black specking occurring in localized areas such as sides and edges of the panel. The first defect is due to over-pickling in the acid bath. Once it occurs it is aggravated by excessive nickel flashing. It is easily recognized on the sheet on lifting from the sulphuric acid bath as a fine black smudge which streaks when wet and when rubbed with the finger tip. It may be eliminated by reducing the acid concentration, time and temperature. If such a defective plate is thoroughly scrubbed with milled enamel slip and washed, the smudge is removed and the black specking no longer develops, such a procedure constituting a final test for this defect.

If scrubbing of the panel is possible in shop practice the smudging may be ignored. Another possibility is continuous filtration of the pickle bath through a bed of scrap iron and maintenance of the pickle bath in continual agitation. Vigorous pressure spray rinsing is also an aid in removal of the smudge when it occurs.

The coarse specking is due to residual iron or nickel salts left on the stock. The vigorous spray rinsing recommended should remove such salts completely. Another means of eliminating the defect is to bake the ware after spraying at 500 deg. to 600 deg. F. to dehydrate the salt residuals completely. However, if rinsing between baths has been properly done, this defect should not occur. This type of black specking is intensified in deep scratches due to inability to clean thoroughly.

A third defect which rarely occurs is due to inadequate grease removal. This manifests itself as a large irregular blister with concentration of enamel at the edges. More vigorous alkaline cleaning will eliminate this.

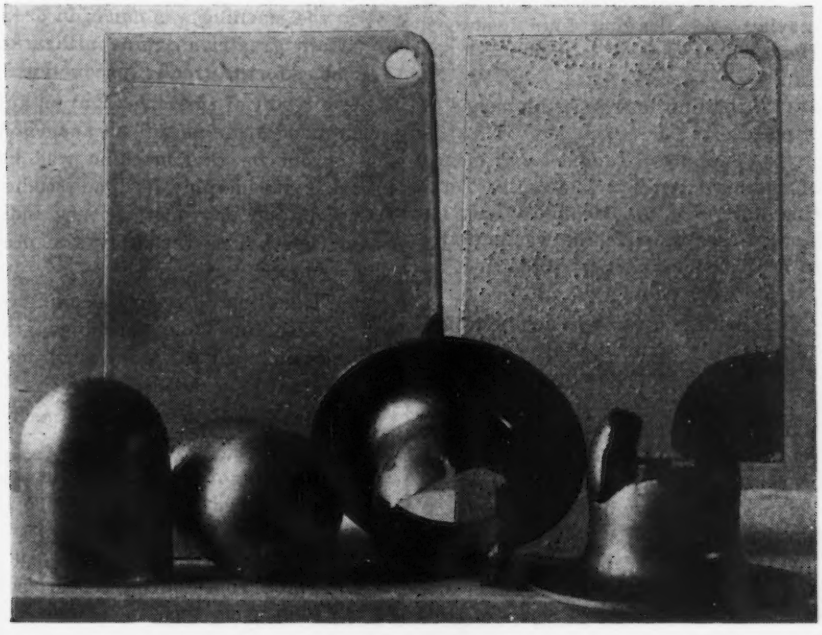
A variety of procedures are known by which adherence can be developed between glass and steel. Adherence-promoting oxides may be incorporated in the enamel, or nickel flashing is generally used for this purpose. By this means the proper adherence-promoting oxide is developed in the enameling cycle. For best adherence, the amount of nickel deposited will vary with the enamel used and must be carefully controlled within the selected limits. For the antimony-free types of enamels (zircon enamels) the optimum appears to be about 0.04 to 0.06 gm. per sq. ft. and the range was 0.025 to 0.10 gm. per sq. ft. Adherence with antimony containing enamels may be obtained in the range 0.025 to 0.15 gm. per sq. ft. and the optimum appears to be about 0.06 to 0.09 gm. per sq. ft.

Satisfactory nickel coatings can be obtained at a pH of 3.0 to 6.5. A pH of 4.0 to 4.5 is required for efficient continuous filtration. Too concentrated, too long immersion, too high a temperature, or a combination of all three in cyanide neutralization tends to dissolve nickel. The necessity for close and continuous control of the nickel baths cannot be overemphasized. Quite often complaints concerning Ni flashing are made on the basis that the coatings deposit in a non-uniform manner. This may be eliminated by stirring the nickel bath during flashing, since the phenomenon is due to concentration depolarization.

A well pickled sheet will have a

(CONTINUED ON PAGE 152)

FIG. 4—Single white enamel coatings on titanium sheet steel, and cup-drawing test specimens, enlarged about 50 per cent. The two perfect cups and the smooth enameled panel at the left were made with steel having a titanium-carbon ratio of about 8. The broken cups and the blistered panel were made under the same conditions respectively, except with steel having a titanium-carbon ratio of 3.3, which is less than the value required for good results.



Equipment Can Do Twice As Much

By H. C. GEPPINGER
Motion Analyst, Planning and Wage Rate Section, General Electric Co., Bridgeport

THIS article deals with one case of many that has confronted industry ever since Pearl Harbor. In their bids for war contracts, industrial concerns often committed themselves to meet specified production requirements only to find that they had to go more than "all out" in order to live up to their promises.

A typical case of not having enough machines to meet production schedules on the machining of a badly needed airplane manifold is here cited as one example of how to make possible the delivery of the right part in the right place at the right time.

This manifold - casting required seven operations on various types of machines for completion. Production schedules demanded 240 pieces per day or 10 pieces per hr., which was to be accomplished by three 8-hr. shifts.

As soon as production was started on this casting and while operators still were in training, further improvements were made on methods, fixtures and tools, and within a reasonable time all operation methods had been developed to the degree that the expected production of 10 pieces per hr. could well be accomplished except on one machine, which delivered only slightly over 5 pieces per hr. Since this was the second operation, all following operations were affected and operators were partially idle. When this low production was substantiated by time studies, suggestions were advanced to increase production, such as:

(1) To secure another machine and to place an immediate order for another jig.

(2) To remove part of the operation to an available single spindle tapping machine and have a jig made for the casting.

These suggestions, however, did not have any favorable response because of the delay caused in getting either a duplicate machine or a fixture. To acquire either one, it was estimated, would delay attainment of schedule by three months or more.

The answer to the problem was really simpler than had been anticipated, and the solution came about as follows:

A man thoroughly acquainted with time and motion study techniques spent approximately one-half hour observing the operator performing the job and then began to analyse the elements of the time study previously taken. The study on the present method disclosed a total time of 10.44 min. per piece, and consisted of three main details, namely:

(1) Handling, filing, gaging of part; brushing of chips from rail and table; assembling four bushings, removing and cleaning four bushings. Done when machine is down = 6.696 min.

(2) Drilling four holes by means of hand feed = 0.564 min.

(3) Tapping of four holes by means of automatic feed = 3.180 min. Total time for piece, 10.440 min. This indicated that the machine was actually in use 0.564 + 3.180 = 3.744 min. or only 35.7 per cent.

It is evident that the machine would quite readily furnish 10 pieces per hr. if a practical way was to be found of re-assigning function of handling, etc., and in determining the degree or amount of brushing chips that would be necessary to maintain accuracy in the positioning and repositioning of the jig at the work spindles. The question as to when should it be done would undoubtedly give a lead in answering the problem. Some of the handling or cleaning, it was decided, could very well be done while the automatic tapping takes place if some thought were given to rearranging the hand functions in a practical sequence. With this principle in mind it was now suggested to utilize the automatic tapping time in the following manner:

Operator	Machine
Remove three remaining drill bushings; get last finished casting, file burrs, and gage four tapped holes.	Tap 1st hole
Brush chips from jig; get next casting ready for machining.	Tap 2nd hole
Brush chips from rails and table.	Tap 3rd hole
Clean four bushings. Brush off remaining chips.	Tap 4th hole

The operator was then instructed not to brush any chips from the jig when moving from hole to hole for drilling since this did not serve any particular purpose at this time. In general, it was pointed out and demonstrated that brushing of chips should, if possible, be avoided entirely when the machine was *down*, in order to attain greater machine utilization and henceforth, greater production.

As a result of this investigation and subsequent training of the operator the output on this machine was increased considerably. Time studies taken on the new method now indicated time values far below the previous method, namely:

(1) Handling necessary cleaning of jig; assembling four bushings, removing one bushing. Done when machine is down = 2.356 min.

(2) Drilling of four holes by means of hand feed = 0.564 min.

(3) Tapping of four holes by means of automatic feed = 3.180 min. Total time per piece = 6.100 min. Now the machine was being used 0.564 + 3.180 = 3.744 min., representing 61 per cent of the total cycle time.

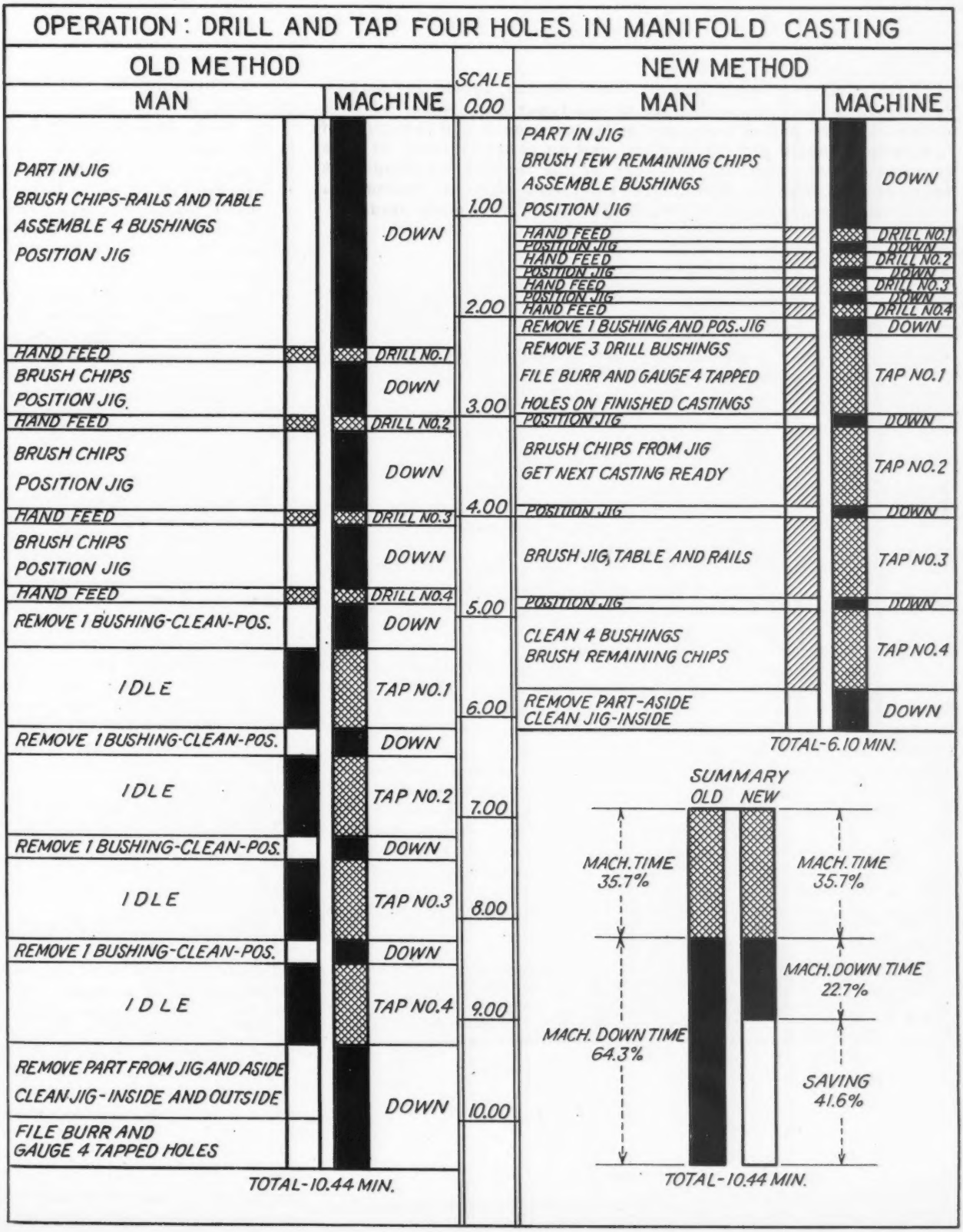
This increase in machine utilization was achieved simply by instructing the operator on two key points,

(1) HOW MUCH brushing of chips is necessary to assure accuracy of positioning and machining.

(2) WHEN should this brushing of chips and some other functions be done.

With this reassignment of manual functions and a slightly better application of the operator, production was raised to a level permitting progressive machining without delays. The operators' earnings also increased and production schedules could be maintained.

The attached "Man and Machine" comparison chart gives a comprehensive detailed picture of the improvements made and the results obtained.



Laminations In Welded Steel Plates

. . . Chemical segregations, usually not serious, should not be confused with laminations, which are of two types, only one of which is dangerous. The author's analysis of the occurence and detection of laminations should put fabricators' and purchasers' minds at ease to some extent. Experience at one of the largest elevated tank fabricators indicates that plate rejections due to laminations amount to about ¼ of one per cent of all steel plate used.

o o o

By Fred L. Goldsby
Assistant to the Chief Engineer, Chicago Bridge & Iron Co.

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LAMINATED plates or shapes are often discovered in the field during tank erection and frequently after they have been completely welded in place and near the end of the job. Discovery at that time proves to be quite annoying and expensive because general practice is to reject and replace any plate or structural shape or a portion thereof which is known to be laminated. If stock plates or shapes are not available for immediate replacement, this may mean delays in completion of the job in spite of extra effort of the mills and fabricating shops in getting out replacement sections.

If routine inspection methods reveal a laminated plate after it has been welded in place, there immediately arises in the purchaser's mind the question: "How can I be sure there are not other laminated plates in the structure, and if there are, is the structure endangered by their existence?"

The only answer to the first part of this question is "You can't be sure." To the writer's knowledge there is no practical method of inspection available by which the entire area of a plate or structural shape can be surveyed for the detection of internal laminations which are not visible at the edge of the section or at the surface of the plate.

To make a positive answer to the second part of the purchasers question is difficult but his mind may be eased if the following pertinent facts regarding laminations are considered.

Laminations usually are of two types:

(1) Those which are parallel or approximately so to the plate surface throughout its area, Fig. 1.

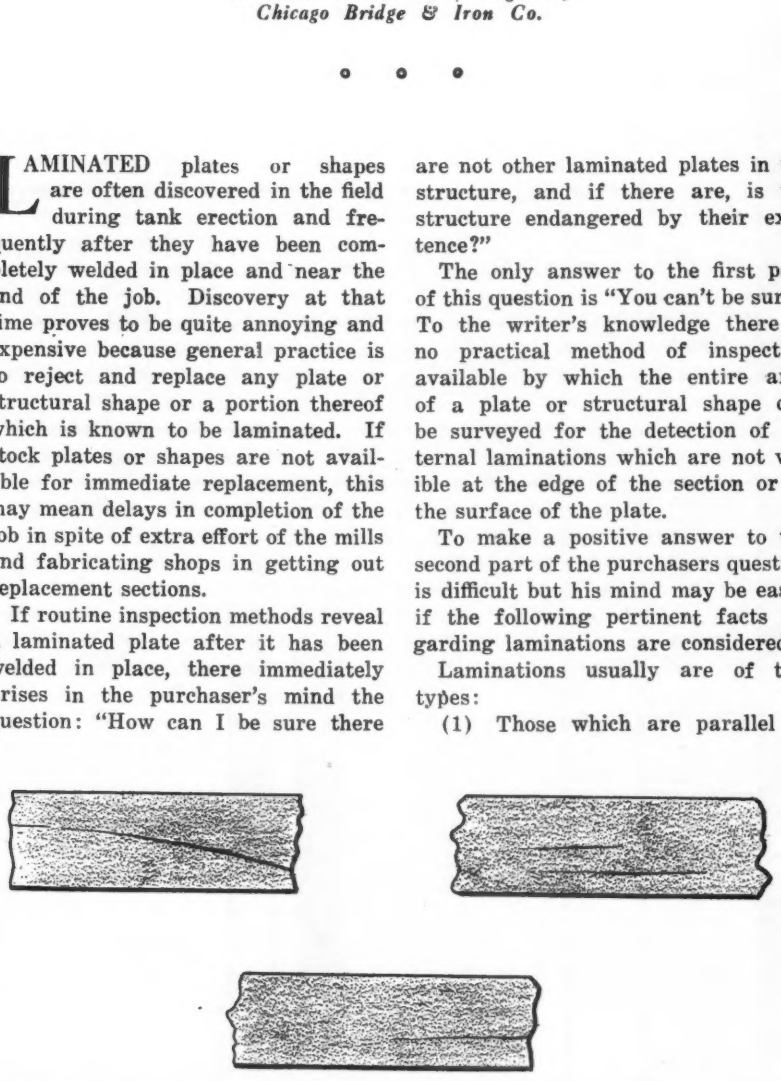

FIG. 1—Section through plates showing type 1 laminations, running approximately parallel with the surface..

(2) Those which are not parallel to the plate surface but which may have one or both edges coming to the surface, See Fig. 2. While this type of defect is commonly called a lamination by fabricators, those in the steel industry refer to such defects as scabs, snakes, seams or slivers.

The first type of lamination is the more common, the harder to detect if not exposed at the edge of the section, but fortunately the less dangerous in tank construction. In the usual type of tank construction the plates are subject to pure tension (hoop) stresses. It can therefore be seen that if a plate is laminated and the joint design is such that both parts of the laminated plate are joined together, the component parts will act as one. Except for pre-stressing, the well known thick walled layer vessels used for high pressure service correspond to a series of laminated plates.

During the past two years a great many old tanks have been cut down and re-erected. During these operations many laminated plates of the first type have been discovered, giving further proof that this type of lamination is not serious. Even so, if such laminations are known to exist, the plate or a portion thereof is usually replaced due to the uncertainty as to whether the lamination remains parallel to the plate surface or extends to the surface at some undetected point.

Laminations or defects of the second type are more serious since they will cause a separation of the plate preventing it from acting as a unit. One edge of such a defect may be exposed at the edge of a plate and the other edge may be found at the surface of the plate some distance in from the edge, although tight mill scale may frequently hide the surface edge and prevent its detection. This uncertainty in being able to positively classify laminations into one or the other of the two types is the chief reason why it is considered good practice

to reject and replace any known laminated plates.

Chemical segregation in plates is often confused with laminations, particularly during Magnaflux inspections and on acid etched samples. To distinguish between the two, the major causes of laminations and chemical segregation should be considered.

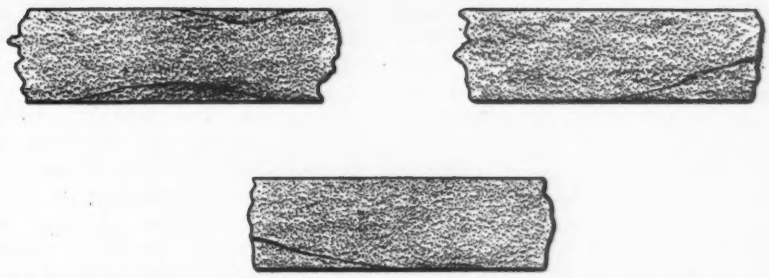

FIG. 2—Section through plates showing type 2 laminations, referred to in the steel industry as scabs, snakes, seams or slivers.

Pipes in Ingots

When an ingot is poured, cooling of the liquid metal starts at the walls of the mold and solidification advances into the melt from all directions. Gases rise from the molten metal and are liberated at the top of the mold until the surface cools sufficiently to freeze, thus preventing further release of the gases. As freezing and shrinkage continues a cone shaped cavity or "pipe" is formed at the top center of the mold extending some distance into the ingot (See Fig. 3). When a billet or slab is prepared from the ingot the pipe is cropped. Occasionally, however, a pipe may bridge over and cropping is not carried far enough to remove all traces of the pipe. The surfaces of the remaining portion of the pipe become oxidized and therefore do not thoroughly weld together when the slab is rolled into a plate. This results in a lamination and is probably the most common cause of laminations. Such laminations usually are parallel to the plate surfaces and depending on the size of the uncropped pipe, may be found in the finished plate as a small elongated lamination at one end of a plate or may range almost the full length of a plate.

Frequently, cooling of the ingot progresses so rapidly that gases may be trapped throughout the ingot, causing what is commonly known as blow holes. Due to the relatively slower cooling at the center of the mold, blow holes in the central portion are not oxidized and therefore weld together when the slab is rolled. Blow holes near the skin of the ingot oxidize and do not weld together during the forming of the ingot or rolling of the slab into a plate, thereby resulting in a seam or lamination. These may be found at almost any location in a plate and the size of the lamination may range from a small circular area to a rather large elliptical shaped defect depending on the size of the original blow hole and amount of rolling the plate has received. This type of lamination usually runs parallel to the plate surface but one edge may occasionally be forced to the surface, resulting in the more dangerous form of lamination. Laminations caused by blow holes are mostly commonly found in steels not thoroughly deoxidized in their manufacture.

Surface Defects in Ingot

Defects in the surface of the ingot mold may affect cooling at the ingot skin which results in surface checking or small cracks which produce seamy products and result in small laminations or defects in the finished plate. Such laminations usually have one edge exposed at the surface of a plate. Due to the smallness of such laminations it is difficult to detect them, especially if the surface edge is covered with mill scale. Fortunately, due to their size they are seldom dangerous.

Due to improper pouring of an ingot the molten metal may splash from the bottom of the mold to the sides where it may be suddenly chilled and cling to the surface of the mold. If not thoroughly remelted during the balance of the pour this section appears as a scab. Scabs which escape detection on the ingot may then be rolled into a plate, forming serious defects of various sizes and depths. Some portions of the edges of laminations caused by scabs are usually visible on the surface, making their discovery likely before complete fabrication or erection takes place.

Occasionally splits or cracks in the ingot due to roughness or cavities in the molds may result in a crack or tear in the ingot surface 2 or 3 in. deep. Unless hidden by mill scale, these defects when rolled appear in the finished plate as seams of various sizes with one edge visible at the surface. This type of defect is most commonly found in steels having a carbon range of 0.17 to 0.24 per cent.

Defects commonly known as laps may be rolled into a plate causing a lamination, one edge of which usually appears at the surface of the plate. Such defects are usually the result of a crack in a roll or spreading of the collars between rolls. They may also be caused by unequal draught in the length of the rolls.

Segregations Defined

In steel making, segregation is a term usually applied to the upper central portion of the ingot, just below the pipe where various elements or impurities in the steel tend to segregate and are more concentrated than in other parts of the ingot. This is due to the fact that in ingots the first metal to freeze is rich in iron

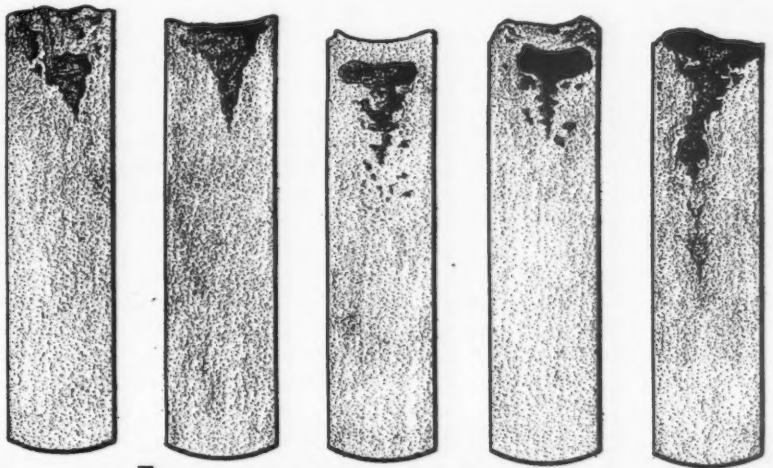

FIG. 3—Split ingots, showing various forms of pipes.

and crystallizes first at the mold walls. On continued solidification of molten metal, the remaining liquid becomes richer in carbon and particularly the impurities sulphur or phosphorous. Since the upper central portion of the ingot cools or freezes last, the greatest concentration of impurities occur in that region. It is thought that during the soaking and rolling of the ingot, the heat transfer and mechanical rolling action causes further segregation of impurities and elements such as phosphorous, sulphur and carbon. Segregation of this type may appear throughout the plate and is often detected on the planed edge of plates by some inspection methods.

due to the steel mills for their part in keeping laminations and defects in the finished product to a minimum. Clean molds for ingots, careful pouring, proper composition, controlled heating and cooling, together with thorough deoxidation are the chief factors in the prevention of defects in the ingot or billet. Close cropping of the ingots is largely responsible for elimination of laminations due to pipes. Ingots and billets are descaled and surface inspected at the mill for possible scabs, blisters, cavities or cracks which might result in defects in the finished plate.

Use of correct rolling temperatures, maintenance of rolls in good repair and expert manipulation of the rolls

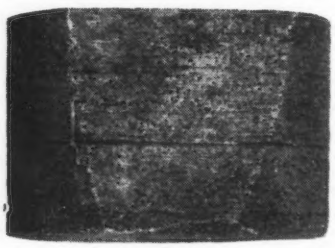

FIG. 4—Etched sample trepanned plugs, showing porous or banded structure. Top: Chemical segregation. Bottom: Type 1 laminations (see Fig. 1).

When trepanned plugs are cut from welded seams and acid etched for examination, separations are often noted which appear to be laminations. It is the writer's opinion based on the examination of numerous plugs of this type that many of these defects are not true laminations but are due to the etching out of segregated impurities or elements which result in steel having a laminated or banded appearance. In severe cases the resulting etched plug may reveal the parent metal to be excessively banded or porous, Fig. 4. This condition is often referred to as "dirty steel." Segregation of this type is usually not dangerous and does not seriously affect the over-all strength of the plate unless it is extensive enough to affect the welding quality of the steel. In such cases investigation will usually reveal an unbalanced chemical composition and trouble with cracks during welding.

The old adage "an ounce of prevention is worth a pound of cure" is particularly applicable to the defects described, and much credit is to insure proper draught do much to prevent defects due to laps, cracks or tears during that phase of manufacture.

Inspection Methods

In spite of the above precautions on the part of the mill, some laminations and other defects escape detection and are revealed by subsequent fabrication and erection of the finished plate.

Employees of some fabricating shops are given monetary rewards for discovering laminations which cause rejection of the plate. This encourages close inspection of all plates through all stages of fabrication. Close surface and edge inspections of plates are made by the markers or layout crew. During shearing, planing, burning or chipping of the edges of a plate for subsequent welding or caulking, particular note of the chips or plate edge is taken. During such operations laminations which extend to the edge of the plate will nearly always be revealed by the chips or burrs splitting or the seam opening up due to heat.

During the final operation of rolling or dishing, the plates are once more carefully surface inspected since by that stage of fabrication the plate has weathered somewhat so that part of the mill scale falls off during the forming of the plate to the tank radius. Such close shop inspection is generally successful in revealing surface defects and laminations which come to the surface or extend to the edge of a plate. If, however, one "slips by" there is still a chance for its discovery during field erection by the following methods.

In riveted work caulking along the edge of a seam may open up a lamination. The heat due to hot rivets sometimes reveals the presence of blisters along the seam. In such cases if further investigations reveal defects of serious nature, the plates are replaced.

In welded work the heat of welding often opens up tight edge laminations overlooked during previous inspections. In such cases even if the welder does not see the plate open or separate, the split will usually affect the arc sufficiently to call the welder's attention to the defect.

Sometimes in knocking off nuts, lugs or other erection gadgets welded to the plate a portion of the plate will tear out, revealing the presence of a lamination which does not extend to the edge of the plate. In such cases further inspection by sectioning or trepanning is made to determine the extent of the lamination and size of replacement plate required.

Chisel Test

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The experience of the Chicago Bridge & Iron Co. indicates that plate rejections from the defects described and discovered by inspection methods outlined amount to approximately 0.25 per cent of all plates used.

With a more complete understanding of the cause and nature of laminations, methods used in detection of them, and the possibility of their occurrence in the completed structures, the fabricator's mind should be put a little more at ease regarding those laminations which may escape detection and which possibly exist in all steel structures.

Industrial X-Ray Exposures Timed Automatically

THE object image cast on a fluorescent screen by X-rays can be photographed by a camera on miniature films or rolls and later projected. This use of photo-fluoroscopic exposures which average in cost about 1c. as against 60c. for the standard 14x17 in. X-ray film, represents a real economy. Although a photograph made of the image on the fluorescent screen will not possess the definition of a straight X-ray print, for many types of industrial analysis and inspection the degree of definition is not critical.

Now, for the first time an electronic method for controlling photo-fluoroscopic exposures has been developed, making it possible to obtain uniformly dense exposures on miniature film automatically. Although first used in medical radiography for mass chest surveys on miniature roll films, the electronic timer, a development of the Westinghouse Electric & Mfg. Co., will undoubtedly find in industrial X-ray analysis. The timer operates on the principle of the light exposure meter which amateur photographers use. X-ray radiation, passing through an object, strikes the fluorescent screen. A section of the luminous screen is scanned by a photoelectric tube which in effect measures the light leaving the screen. When enough light has left the screen for the desired film exposure, the photoelectric timer actuates a relay, opening the X-ray circuit and terminating the exposure.

The operator need only position the object before the fluorescent screen and close the exposure switch by a touch of the hand. The timer then not only terminates the exposure at the proper moment, but an auxiliary circuit prevents overloading the X-ray tube. Objects such as castings, conducted on conveyors, can be quickly and uniformly photographed on miniature roll film. Large, irregular objects need only be positioned before the screen. Since the photoelectric control responds to the actual light on the screen, deviations in the internal structure of the object X-rayed will not deceive the timer, and the result will be films of uniform density and analytically satisfactory.

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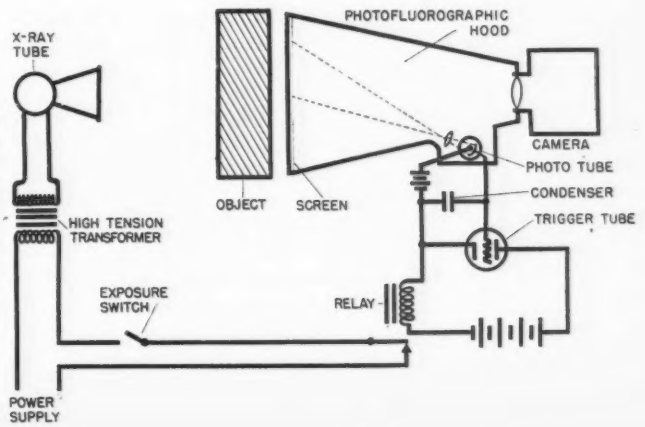

SCHEMATIC diagram showing the connection of the electronic timer and the power supply to the X-ray tube. The timer shuts off power to the X-ray tube after the miniature film has received the proper exposure in the camera.

and crystallizes first at the mold walls. On continued solidification of molten metal, the remaining liquid becomes richer in carbon and particularly the impurities sulphur or phosphorous. Since the upper central portion of the ingot cools or freezes last, the greatest concentration of impurities occur in that region. It is thought that during the soaking and rolling of the ingot, the heat transfer and mechanical rolling action causes further segregation of impurities and elements such as phosphorous, sulphur and carbon. Segregation of this type may appear throughout the plate and is often detected on the planed edge of plates by some inspection methods.

due to the steel mills for their part in keeping laminations and defects in the finished product to a minimum. Clean molds for ingots, careful pouring, proper composition, controlled heating and cooling, together with thorough deoxidation are the chief factors in the prevention of defects in the ingot or billet. Close cropping of the ingots is largely responsible for elimination of laminations due to pipes. Ingots and billets are descaled and surface inspected at the mill for possible scabs, blisters, cavities or cracks which might result in defects in the finished plate.

Use of correct rolling temperatures, maintenance of rolls in good repair and expert manipulation of the rolls

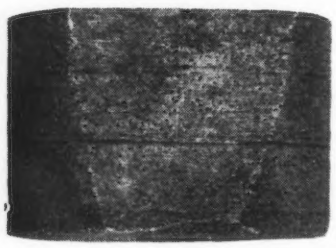

FIG. 4—Etched sample trepanned plugs, showing porous or banded structure. Top: Chemical segregation. Bottom: Type 1 laminations (see Fig. 1).

When trepanned plugs are cut from welded seams and acid etched for examination, separations are often noted which appear to be laminations. It is the writer's opinion based on the examination of numerous plugs of this type that many of these defects are not true laminations but are due to the etching out of segregated impurities or elements which result in steel having a laminated or banded appearance. In severe cases the resulting etched plug may reveal the parent metal to be excessively banded or porous, Fig. 4. This condition is often referred to as "dirty steel." Segregation of this type is usually not dangerous and does not seriously affect the over-all strength of the plate unless it is extensive enough to affect the welding quality of the steel. In such cases investigation will usually reveal an unbalanced chemical composition and trouble with cracks during welding.

The old adage "an ounce of prevention is worth a pound of cure" is particularly applicable to the defects described, and much credit is to insure proper draught do much to prevent defects due to laps, cracks or tears during that phase of manufacture.

Inspection Methods

In spite of the above precautions on the part of the mill, some laminations and other defects escape detection and are revealed by subsequent fabrication and erection of the finished plate.

Employees of some fabricating shops are given monetary rewards for discovering laminations which cause rejection of the plate. This encourages close inspection of all plates through all stages of fabrication. Close surface and edge inspections of plates are made by the markers or layout crew. During shearing, planing, burning or chipping of the edges of a plate for subsequent welding or caulking, particular note of the chips or plate edge is taken. During such operations laminations which extend to the edge of the plate will nearly always be revealed by the chips or burrs splitting or the seam opening up due to heat.

During the final operation of rolling or dishing, the plates are once more carefully surface inspected since by that stage of fabrication the plate has weathered somewhat so that part of the mill scale falls off during the forming of the plate to the tank radius. Such close shop inspection is generally successful in revealing surface defects and laminations which come to the surface or extend to the edge of a plate. If, however, one "slips by" there is still a chance for its discovery during field erection by the following methods.

In riveted work caulking along the edge of a seam may open up a lamination. The heat due to hot rivets sometimes reveals the presence of blisters along the seam. In such cases if further investigations reveal defects of serious nature, the plates are replaced.

In welded work the heat of welding often opens up tight edge laminations overlooked during previous inspections. In such cases even if the welder does not see the plate open or separate, the split will usually affect the arc sufficiently to call the welder's attention to the defect.

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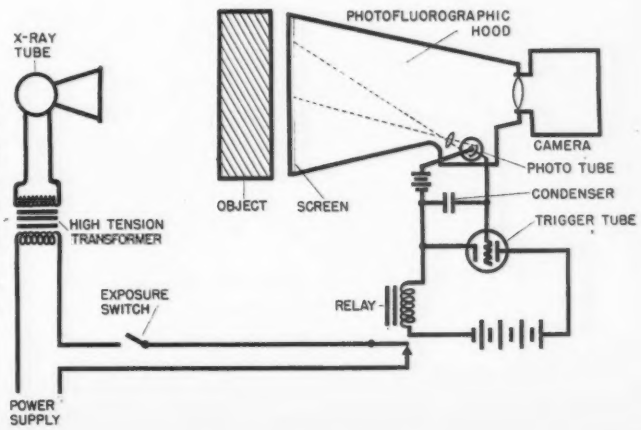

SCHEMATIC diagram showing the connection of the electronic timer and the power supply to the X-ray tube. The timer shuts off power to the X-ray tube after the miniature film has received the proper exposure in the camera.

▲ ▲ ▲ A Simplified Approach

NO one bothers to explain to the old line inspector that quality control is actually his own system of inspection grown up and standardized so that not only can the results of previous inspections be used to determine the quality of the material being manufactured, but also it can be used to determine the future inspection procedure.

If the average inspector became interested enough to read up on quality control, or tried to acquire knowledge by taking a course in its theory and application, he was confronted with some such requirements as the following: A basic knowledge of higher statistical mathematics, frequency distribution, three sigma limits, standard deviation (or more simply, the root-mean-square deviation of the observed values from their average), binominal expansion, variables inspection, etc. In addition he had to familiarize himself with some difficult terminology in quality control. Is it any wonder that he reacted with an amount of natural belligerency to the installation of quality control, or its namesake, standard sampling inspection?

A good knowledge of the procedures or a method of doing something can go a long way toward accomplishing good results in any art. There is no reason why an inspector cannot use a system of quality control without having to know the theory of probabilities or statistical methods.

Any sampling inspection plan, whether it is a final inspection or a process inspection plan, involves taking a sample and determining from the results of inspecting this sample, the acceptance or rejection of the material in question. The main difference between the more prevalent sampling plans and a quality control inspection plan, is that in quality control, definite acceptance criteria, amounts of inspection, method of sampling, and classification of quality characteristics (either dimensionally or visually) are established before any actual decision is made as to the disposition of the material in question. In most other inspection plans the underlying ideas are more or less in the inspector's mind at the time of inspection. However, when this information is not definitely established to the common knowledge of everyone concerned, too often one will get varied results from inspecting material of the same quality. In other words, inspection results are allowed to depend mostly on subjective factors and not actually on the quality of the material.

Quality control was initiated in the early 1920's, but it was not until the present emergency caused enormous increases in production volume along with a scarcity of experienced inspectors that the need for a scientific approach to inspection became imperative. With the acceptance and establishment of quality control procedures by the Ordnance Department and later by the Army Service Forces, quality control came into its own.

No attempt will be made here to explain the mathematical theory on which quality control is based, but rather to provide a simple working plan for both acceptance control and process control inspection for those people who have decided that quality control might be worth a try in their own plant or shop.

Types of Inspection

In the first place there are two types of inspections to deal with, namely, (1) inspection of material produced by a vendor and (2), inspection of material being produced in one's own plant. The first type requires the application of *acceptance control*, a method by which the manufacturer can decide whether to accept the material as it is, or reject it for return or further inspection. The second type requires the application of *process control*, which will provide a basis for action for the manufacturer as far as his own production line is concerned. In other words, it provides a means by which he can determine whether or not his processes need adjustment.

Both types are viewed as entirely independent of each other, but it may be seen that if both are being used together on the same material any improvement made in process control is bound to be an asset toward improvement in acceptance inspection.

Since the first type mentioned, namely acceptance control, is the simplest to institute it will be examined first. A prerequisite for application of acceptance control is that the material is being manufactured in large quantities and that a steady flow of it can be expected. It is worth realizing that the material need not be entirely perfect to be satisfactory, for material manufactured under mass production conditions normally con-

TABLE I

Single and Double Sampling Table
Data in this table corresponds closely to that used by the Army Service Forces

Lot Size		500 to 799	800 to 1299	1300 to 3199	3200 to 7999	8000 to 21,999	22,000 to 109,999	110,000 to 549,999	
First Sample		50	75	100	150	200	300	500	
Second Sample		100	150	200	300	400	600	1000	
Level		Accp. Nos.	Accp. Nos.	Accp. Nos.	Accp. Nos.	Accp. Nos.	Accp. Nos.	Accp. Nos.	Per Cent Defective Limit
Major	Minor	C_1 C_2	C_1 C_2	C_1 C_2	C_1 C_2	C_1 C_2	C_1 C_2	C_1 C_2	
A	X	1 3	2 4	2 6	3 9	4 11	5 13	7 23	2.0
B	A	2 4	3 5	3 8	5 13	6 16	8 25	14 40	3.0
C	B	3 5	4 8	5 11	7 18	9 24	12 35	19 58	4.0
D	C	3 9	5 11	6 16	9 23	11 32	16 47	25 76	5.0
E	D	4 10	6 14	8 19	11 28	14 37	21 54	33 87	6.0
X	E	5 12	7 17	10 23	14 33	18 44	26 64	43 98	8.0

To Quality Control

By GEORGE O. CUTTER
Springfield, Mass.

. . . The author, who is in charge of a quality control department, takes the view that a flat-footed application of the control chart can go a long way in obtaining results in quality control with the average inspection force and in convincing them of the validity of the method without going into the mathematical foundations of the statistical method.

tains a small proportion of defective pieces even though the best manufacturing equipment is used, and the manufacturer exercises the greatest care in maintaining quality. It is, therefore, to one's advantage to come to an agreement with the vendor to accept lots of material containing a small number of defective pieces, which when found later, can either be scrapped or returned for credit, depending upon the arrangement.

Dimensions Breakdown

In the drawing furnished the vendor showing the requirements which he is expected to conform to in making the part, there are certain dimensions the holding of which is quite important to the proper working of the piece, and there are others which are merely limiting or design dimensions. The thing to do is to list all the dimensions that are to be checked and maintained. The list should then be divided into the dimensions that are primary, and these may be called *majors*, and those that are not as important may be referred to as *minors*. This listing and dividing of dimensions, called a "classification of defects," should be sent along with the drawing to the vendor together with an outline of the inspection plan to be used in the acceptance of the material. The vendor should be informed that samples are going to be taken from each lot or shipment and checked on all of the dimensions listed in the classification of defects and that if no more defective pieces are found in either the major or minor classifications than had been originally agreed upon, the entire lot or shipment will be accepted without further inspection. However if this acceptance number of defective pieces is exceeded, the complete lot or shipment will either be returned to the vendor for reinspection or he will be charged for the reinspection necessary.

Acceptance Numbers

This naturally brings up the question of acceptance numbers, or the number of defective pieces that can and will be accepted in a lot of material, as shown by the sample. It is common practice upon the part of manufacturers who are going to further process material purchased on the outside, to allow for approximately 5 per cent of the material to be defective, knowing that they can eliminate this defective material when found along their own production line. However, this is a matter of individual judgment and one that depends upon several factors, namely, (1) the number of suppliers that can be obtained for the piece in question, (2) whether or not the material is going to be marketed as is, or further processed, and (3) the number of dimensions on the piece that is going to be checked. Therefore the percentage of defective material that a shop is willing to accept, plus the classification of defects or dimensions that is going to be checked, should be decided jointly by the engineering and inspection departments. From Table I should be chosen the lot size, sample size, per cent defective, and acceptance numbers that is most appropriate for each individual case.

On the far right hand side, Table I gives a limiting value which is the per cent defective limit that should not be exceeded for the acceptance numbers used. The table allows one to choose a level or levels for both major and minor dimensions in combinations from 4 per cent allowable defectives up to 16 per cent, and gives the proper sample sizes to take from lots varying from 500 up to 550,000 pieces. To treat material under 500 pieces on a sampling basis has not been found practical.

As can be seen from Table I, the plan involves second or double sampling. In other words, if a lot of material is very good or very bad, a single sample is all that one needs to determine acceptance or rejection, but if the sample is of borderline quality the lot remains in doubt and a second sample, double the first, is needed to remove this doubt. It is possible to avoid the occurrence of doubtful cases in single sampling by making the first sample sufficiently large. However, it has been found that the average amount of inspection that must be performed can be made much less by using a double sampling system. That is why under the various columns where acceptance numbers are listed there appear the two letters C_1 and C_2. The C_1 being the number of defectives which if not exceeded in the first sample means that the material is satisfactory, and C_2 being the number of defectives which if exceeded in the first sample means that the material is unsatisfactory. The number of defectives found to be in between these numbers means that a second sample must be taken.

Applying the Table

Suppose, for example, parts are being procured from a vendor who is shipping them in lots of 3500 pieces and the dimensions of the pieces that are going to be checked have been listed as major and minor. It has been decided to accept not greater than 2 per cent major and 3 per cent minor, or an overall per cent defective not greater than 5. Under the sub-lot size column in Table I of 3200 to 7999 pieces is found the sample size of 150 pieces, taken at random. Likewise, if a second sample is necessary, 300 more pieces will have to be chosen also at random. Now, finding 2 per cent on the right hand side follow across to the left on the same level until the two acceptance num-

bers 3 and 9 are found under the lot size column of 3200 to 7999. Since these are for the majors, on the far left hand side of the table, the capital letter A, under the major column will be found. Since it has been decided that 3 per cent defective on the minors will be acceptable, do the same thing on the 3 per cent level and under the lot size of 3200 to 7999 will be found the acceptance number 5 and 13, and also the capital letter A under the minor column.

What this signifies is that out of the 3500 pieces waiting for inspection, 150 pieces will be taken at random and inspected on all of the dimensions listed in the classification. If three defective pieces in the majors or five defective pieces in the minors are not exceeded the lot of 3500 pieces will be accepted. If either the nine defective pieces in the major or 13 defective pieces in the minor are exceeded the entire 3500 pieces must be rejected as being defective. However, if on the first sample a number of defectives on the major are found between three and 9 and/or between five and 13 on the minors, it is necessary to take a second sample, double the first, or 300 more pieces.

In the inspection of this second sample as soon as the number of defectives found plus the number of defectives uncovered in the first sample exceeds nine in the majors and 13 in the minors, the lot can be rejected. If on completion of the 300 pieces the total number of defectives found in the first and second samples does not exceed these numbers of nine and 13 the lot can be accepted. It should be stated that to have the system work according to plan, the acceptance numbers chosen must be adhered to rigidly, remembering that an opinion of the whole lot is being based upon the results obtained in the sample, and that if defects found in the sample are ignored, then actually many more of the same type of defects might be ignored in the lot.

TABLE II

Typical Data Sheet Preparatory To Making Control Chart.

TYPE OF MACHINE: Brown & Sharpe, No. 0	RATE OF PRODUCTION: 175/hr.
SAMPLING INTERVAL: 30 min.	NUMBER IN SAMPLE: 5
DRAWING NUMBER: B 2113642	PART NAME: Rod Feeder

DIMENSION CHECKED: .400 + .005 outside diameter

Shift and Date	Time of Sampling	RESULTS OF FIRST TEN SAMPLES					X′ Totals	X′ Means	R Ranges
	8:30 A.M.	.4012	.4031	.4021	.4018	.4023	2.0105	.4021	.0019
	9:00	.4015	.4023	.4025	.4019	.4036	2.0118	.4024	.0021
	9:30	.4023	.4016	.4021	.4032	.4018	2.0110	.4022	.0016
9/12/44	10:00	.4031	.4020	.4034	.4021	.4026	2.0132	.4026	.0014
	10:30	.4021	.4026	.4013	.4036	.4021	2.0117	.4023	.0023
7-3	11:00	.4018	.4023	.4016	.4032	.4026	2.0115	.4023	.0016
	11:30	.4022	.4026	.4018	.4034	.4029	2.0129	.4026	.0016
	12:30 P.M.	.4038	.4026	.4031	.4022	.4019	2.0136	.4027	.0019
	1:00	.4025	.4019	.4032	.4036	.4028	2.0140	.4028	.0017
	1:30	.4023	.4028	.4035	.4031	.4019	2.0136	.4027	.0016
							TOTALS	4.0247	.0177

COMPUTING FACTORS A = 0.58; B = 2.11

AR′ = .0010 BR′ = .0038

TOTALS DIVIDED BY TEN — GRAND MEAN (X″) .4025; AVERAGE RANGE (R′) .0018

LIMITS ON GRAND MEAN OF TEN SAMPLES (X″ ± AR′) or .4035 and .4015

LIMIT ON AVERAGE RANGE OF TEN SAMPLES (BR′) or .0038

Shift and Date	Time of Sampling	RESULTS OF NEXT FIFTEEN SAMPLES					X′ Totals	X′ Means	R Ranges
	2:00 P.M.	.4024	.4036	.4031	.4028	.4021	2.0140	.4028	.0015
	2:30	.4036	.4031	.4022	.4041	.4026	2.0156	.4031	.0019
	3:30	.4034	.4028	.4036	.4023	.4039	2.0160	.4032	.0016
9/12/44	4:00	.4013	.4002	.4018	.4020	.4017	2.0070	.4014	.0018
	4:30	.4018	.4021	.4016	.4022	.4026	2.0103	.4021	.0010
	5:00	.4023	.4019	.4018	.4025	.4016	2.0101	.4020	.0009
3-11	5:30	.4026	.4021	.4015	.4023	.4019	2.0104	.4021	.0011
	6:00	.4018	.4023	.4031	.4021	.4020	2.0113	.4023	.0013
	7:30	.4026	.4019	.4032	.4029	.4033	2.0139	.4028	.0014
	8:00	.4033	.4021	.4019	.4025	.4023	2.0121	.4024	.0014
	8:30	.4029	.4028	.4021	.4034	.4026	2.0138	.4028	.0013
	9:00	.4036	.4032	.4022	.4027	.4025	2.0142	.4028	.0014
	9:30	.4027	.4019	.4032	.4036	.4031	2.0145	.4029	.0017
	10:00	.4035	.4027	.4020	.4029	.4034	2.0145	.4029	.0015
	10:30	.4031	.4029	.4023	.4036	.4027	2.0146	.4029	.0013

GRAND MEAN OF 25 SAMPLES 4.0247 + 6.0385/25 = .40253 .4025 — AVERAGE RANGE OF 25 SAMPLES 0.0177 + 0.0211/25 = .00155 .0016 — 6.0385 — .0211

AR′ = .0009; BR′ = .0034

LIMITS ON GRAND MEAN OF TWENTY-FIVE SAMPLES (X″ ± AR′) or .4034 and .4016

LIMIT ON AVERAGE RANGE OF TWENTY-FIVE SAMPLES (BR′) or .0034

Informing the Vendor

A letter to the vendor will inform him of the inspection plan and give him the opportunity to make sure that his material will meet the requirements. The foregoing inspection plan may be condensed for the vendor in the following manner:

"From a shipment of from 3200 to 8000 pieces, a sample of 150 pieces will be inspected for defects indicated (major and minor). If more than three major and five minor defective pieces are found in this sample, a second sample of 300 will be inspected and if more than nine major or 13 minor defectives are in the total samples of 450, the lot will be rejected. It will be noted that the defects listed as major are those that will probably result in defective material. Those listed as minor may cause some difficulty in further processing but will not be too serious."

A record of the number of pieces that are actually inspected, together with the number of defectives found, should be kept so that at any time the process average or per cent defective of the material offered can be computed. In other words, using the above example, if 20 shipments of 3500 pieces each had been received from a vendor, 3000 pieces would have been inspected on first samples, and if the total number of defectives found on these first samples were 45 pieces on the major and 75 on the minor, the material being offered could be considered 1.5 per cent defective on majors and 2.5 per cent defective on minors. From this process average could be determined the future inspection plan in regard to requiring the vendor to

improve the quality of the material or not.

The final quality of material, or quality production, can be insured in two ways, either by effective manufacturing control over material in the beginning or by literally inspecting quality into it after it is finished. In other words, to obtain quality merchandise one has to have control either at the machines or at final inspection. It is obvious which is the less expensive. The cheapest way to operate in most cases is to have adequate control over the machines themselves and to be ready to shut down the machines and reset them whenever it is found that they are not producing satisfactorily. In order to distinguish the inherent variations of a machine and the variations due to incorrect setting or operation, it is necessary to have some system of control which will not only detect this but will amount to a warning in advance to reset the machines before they actually produce bad work. This is process control. For an explanation of this type of control, or rather the description of the actual procedure, an easier understanding can be obtained through the use of an outline where definite steps are followed rather than by a lengthy treatise on the subject. However, it is necessary to explain that whereas "go" and "not go" type gages are used generally in an acceptance plan, one can get much better results in a process control if the actual measurements are taken on each piece. It is advisable to record on graph paper the drawing tolerances and various control lines that are to be explained below. Standard graph paper with 10 divisions to the in. will be suitable for the purpose.

Control Procedure Example

Table II is an example of a data sheet on one dimension of a part only, and Fig. 1 its corresponding control chart. A dimension was chosen which could be measured easily, and one which had a tolerance of plus 0.005 in. on the outside diameter of 0.4 in. In this case, measurements were made in graduations of 0.0001 in., the practice usually being to use an instrument which can measure in units of 5 to 10 per cent of the total tolerance. This part was chosen particularly because the life of the tool was fairly long and not much trouble is encountered in meeting the drawing tolerances.

I. Samples:

a. Samples should be from 5 to 10 per cent of the sub-lot size unless one is treating extremely large quantities.

TABLE III

List of Computing Factors

Size of Sample	A	B
2	1.88	3.27
3	1.02	2.57
4	0.73	2.28
5	0.58	2.11
6	0.48	2.00
7	0.42	1.92
8	0.37	1.86
9	0.34	1.82
10	0.31	1.78

In the case of a machine producing 200 parts an hr., if it is planned to take samples consisting of five parts, then a sample should be taken once every 20 or 30 min.

(Note—As can be seen from Table II, it was decided to take samples of five every 30 min. in this illustrated example.)

b. Samples should be small, preferably not less than three and not more than 10.

c. There are two ways of taking samples:

(1) From an accumulation of pieces at random.

(2) The last five pieces off the machine.

There are obvious advantages for either way, depending on what information is wanted. Method (1) gives control of the complete product from sample to sample, and should be used on finished items that are not going to be further processed. Method (2) should be used in all other cases, as it gives valuable information to the setter of the machine as to its latest operation, etc.

II. Use of Samples:

a. Measure the dimension on each sample chosen.

b. Add these dimensions together and divide by the number of samples taken. This gives the samples mean, which is called X′ (or X bar). In this case the individual values are listed under the Means in the table.

c. Subtract the smallest individual measurement in the sample from the largest. This gives the sample range, *R*, listed under Ranges.

d. Plot the mean *X′* of each sample on a graph and the range *R* on another graph. Both should be on the same paper with the range plotted preferably beneath the mean, as shown in Fig. 1.

III. Control Limits:

a. When 10 samples have been taken, add the means *X′* together and divide the sum by 10. This gives the grand mean *X″* (or X double bar), which in the above example is 0.4025.

b. Add all 10 sample ranges together and divide by 10. This gives the average range or 0.0018.

c. Referring to Table III for com-

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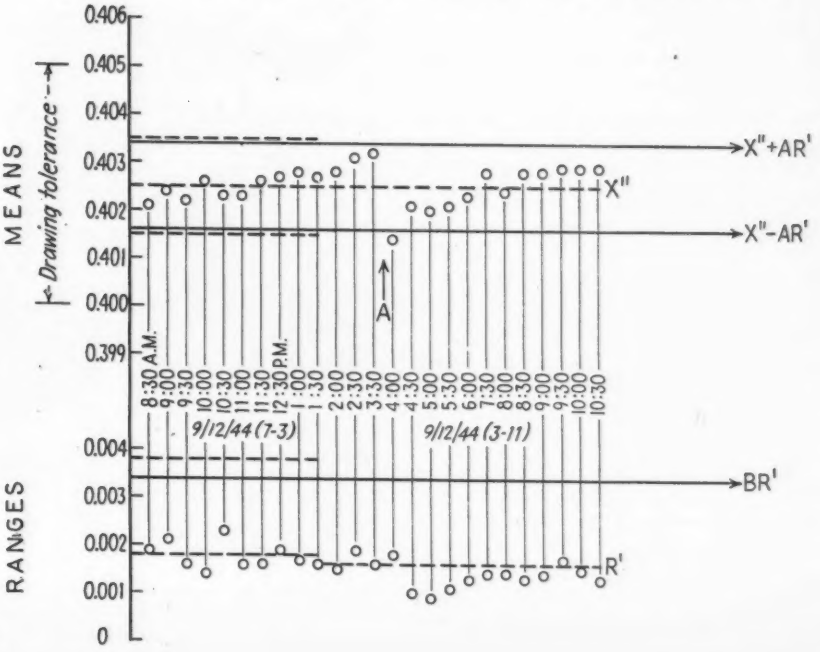
FIG. 1—Quality control chart which enables the inspection department to detect the type of variable in production liable to cause rejections. In the upper chart, "A" indicates a sample below the allowable limit, and one which can be diagnosed as caused by the factor of tool wear. This is proven by the fact that subsequent samples showed an upward trend after the machine was reset at 4.00 p.m. to correct for tool wear.



puting factors, take values of A and B for the number of samples being taken, or as indicated, A is 0.58 and B is 2.11 for samples of five.

d. Calculate AR' and BR' from the above values. $AR' = 0.58 \times 0.0018$ or 0.0010; $BR' = 2.11 \times 0.0018$ or 0.0038.

e. Draw horizontal lines on the chart of the sample means at X''; $X'' - AR'$ and $X'' + AR'$. These lines should be drawn in lightly, for when more samples have been taken they will change. The last two factors are the control lines on the sample means, and in the particular example stated, were found to be equal to 0.4035 and 0.4015.

f. Draw horizontal lines in pencil on the chart for sample ranges at R' and BR'. The line at BR' is the control limit for sample ranges, and here is equal to 0.0038.

g. After 15 more samples have been taken, recompute all the above, and alter the limits accordingly. Once these control limits have been established, no point should fall outside either the range or the means without investigating the process for trouble. The lower half of Table II gives the results of the next 15 samples taken with the control limits recomputed on the grand mean and average range of the entire 25 samples. Fig. 1 shows the control lines altered slightly because of this recomputation and are now drawn in with solid black lines.

IV. Interpretation of the Control Charts:

a. A point outside the limits, on the mean chart or a series of points approaching a control limit is an indication of a controllable factor causing the variation such as tool wear. The letter A in Fig. 1 indicates the advisability of resetting the machine for tool wear as shown by the series of points drifting toward the upper limit, after the resetting was done.

b. A point outside the limit on the range chart means actual trouble with the machine or operator and not just tool wear.

c. It is obvious that if the average range of the samples is greater than the drawing tolerance, or in fact, if it is ever more than 50 per cent of the drawing tolerance, the machine in its present condition is not capable of making the part properly. For if the range of the samples becomes as large as the tolerance, parts naturally will be manufactured outside the tolerance.

d. The values shown in Table III have been computed from a normal "population" with a standard deviation equal to unity. It has been found that control limits set at plus or minus 3 standard deviations is all that can be allowed for samples before they become a true indication of deviating from the parent population. This is why the control limits in the example shown in Fig. 1 are quite a bit inside the tolerance and if exceeded, allow the machine to be corrected before actually making a bad part.

If either plan, acceptance control or process control, is worth trying, it ought to be tried out first on something where results can be easily determined. If more information on the subject of quality control is desired the following is a list of references:

1. American War Standard—"Guide for Quality Control," Z1.1-1941, "Control Chart Method of Analyzing Data" Z1.2-1941 and "Control Chart Method of Controlling Quality During Production" Z1.3-1943, published by American Standards Association, 70 East 45th Street, New York 17.

2. "Sampling Inspection Tables, Single and Double Sampling," by H. F. Dodge and H. G. Romig, John Wiley & Son, New York, 1944.

3. "A First Guide to Quality Control for Engineers," by E. H. Sealy, Ministry of Supply, Advisory Service on Quality Control, London, 1943.

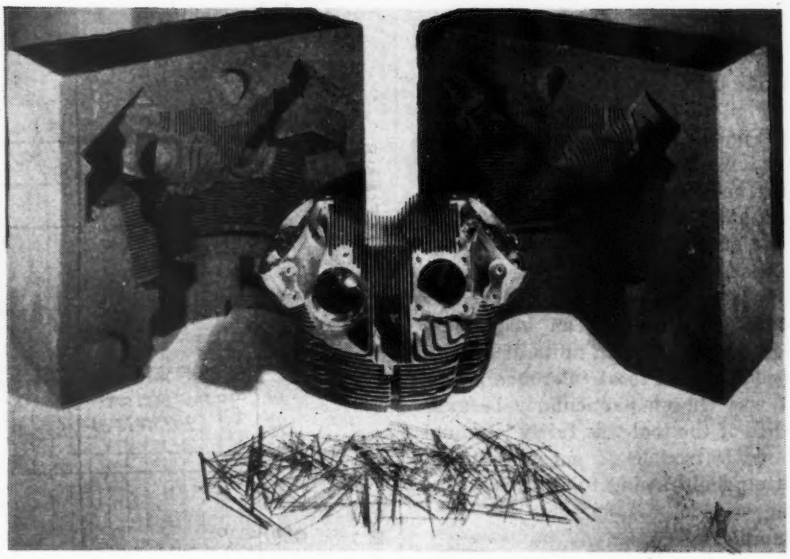
4. "An Engineer's Manual of Statistical Methods," by Col. L. E. Simon, John Wiley & Son, New York, 1941.

5. "Probability and Its Engineering Uses," by Thornton C. Fry, D. Van Nostrand Co., Inc., New York, 1928.

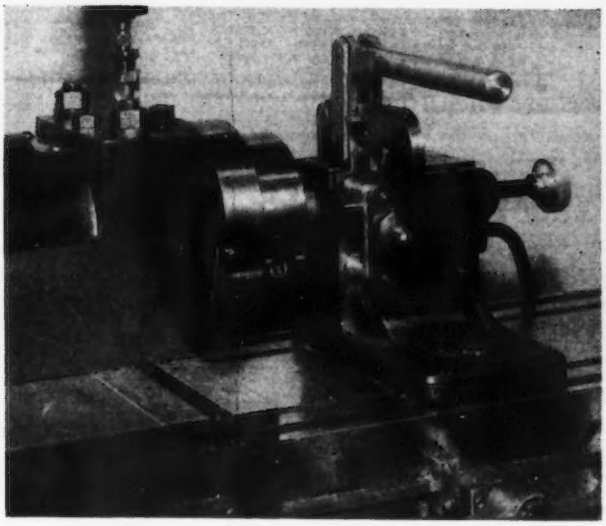
6. "The Economic Control of Manufactured Product," by Walter A. Shewhart, D. Van Nostrand & Co., New York, 1931.

Less Pins in Fins

REDUCTION from 750 to 150 in the number of steel pins which must be hand installed to prevent breakdown of sand mold fins when casting aluminum cylinder heads is reported by the Dodge Chicago plant of Chrysler Corp. In volume production on 2200 hp. 18 cylinder, Wright air-cooled engines used to power the Boeing B-29 and other large aircraft, the Dodge Chicago foundry claims the saving of more than 36 manhours per machine per 8 hr. shift. Pins shown in the photograph are those saved in the operation. Dodge Chicago also claims improved gate and riser design saving from 5 to 10 lb. of aluminum per casting. Mold production has been increased 330 per cent through these and other improvements, they state. When at capacity, 5,000,000 lb. of metal will be poured monthly in the aluminum foundry, which is the largest of its kind in the United States.



CAST aluminum aircraft engine cylinder head and the baked sand molds in which the head is poured. By a change in technique, the 600 pins shown in the foreground have been saved in reinforcing the fin cores. Only 150 are now needed.



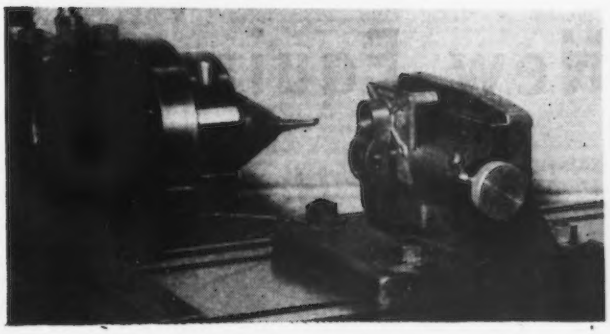


FIG. 2—Machine which bores 0.2500 in. hole showing piece clamped in fixture ready for second boring operation.

LEFT

FIG. 1—Machine which bores 0.1875 in. hole and fixture showing locating pin withdrawn and toggle clamp closed and tightened.

Improved Method of Precision Boring

By C. R. PHIFFER

Radio Transmitter Mfg. Division, Schenectady Works, General Electric Co.

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AN improved method of machining two close tolerance holes in bronze bushings in aluminum gear assembly supports, produces approximately 125 pcs. per hr., as compared with a previous rate of 44 pcs. per hr.

There are two bushings in each support, one having a hole with a finished dimension of 0.2500 in. $+0.0002$ -0.0000 in. and the other having a hole with a 0.1875 in. $+0.0002$ -0.0000 in. tolerance. These holes must be perfectly located with relation to each other since they accommodate shafts upon which meshing gears are mounted.

The conventional method of finish machining the inside diameter of these bushings was to rough ream, chamfer and finish ream on a drill press using reaming jigs. This was a totally hand-fed process.

The improved method of machining these pieces (after chamfering) is on two precision boring machines, one for each size hole. Fig. 1 shows the first machine on which these parts are processed. It is equipped with a boring fixture featuring a sliding pin which, when inserted in the 0.1875 in. hole, positions the piece for boring that hole. The fixture clamp is then tightened on the piece and the locating pin withdrawn. As a safety measure, this locating pin actuates a limit switch in such a way as to break the electrical circuit furnishing power to the machine when inserted in the hole to be bored. Thus, the machine will not run until the pin is withdrawn from the hole. This fixture is opened, closed and tightened all with one hand-operated toggle lever.

The other machine, Fig. 2, which processes the 0.2500 in. hole, is furnished with a boring fixture essentially the same as that on the first machine except that the locating pin is inserted in the 0.1875 in. hole previously bored. This eliminates the necessity of a limit switch arrangement.

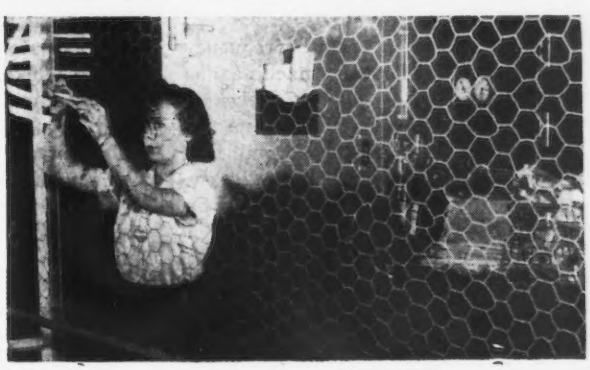
Both machines are equipped with hollow boring tools through which air is blown into the work to serve as a coolant and blow the chips ahead of the tool, preventing scratching of the work.

The rate of feed at which this job is run is 0.001 in. per rev.; the rate of speed is 400 surface ft. per min. When the boring tool has been fed into a depth sufficient to complete the hole, a limit switch is contacted, shutting off power to the motor. The machine spindle is stopped immediately by a plugging switch.

The two machines are placed approximately 30 in. apart, facing each other. One operator runs both machines. The boring time on either hole is less than the time necessary to remove and replace a piece in either fixture. Thus, while one part is being machined, another may be removed and replaced. Another improvement is full automatic feed which reduces tool wear and work spoilage.

EXTREMELY simple in construction, this new type plating rack does away with the individual hanging of numerous small parts and at the same time insures that the surface to be plated faces the anode, assuring uniformity of metal deposit. A further advantage is that it provides a safe, efficient means for draining parts as they are removed from the baths. It was developed by a worker in the Glenn L. Martin plant in Baltimore.

The basic design of the rack consists of tubular metal frame work across which wire mesh is stretched. In use parts are placed in the frame by slipping the ends through the wire mesh where they are held by the natural pressure of the wire. Parts not adapted to this procedure can be hung on the rack with small wire hooks. Use of the new racks has cut loading time in half.

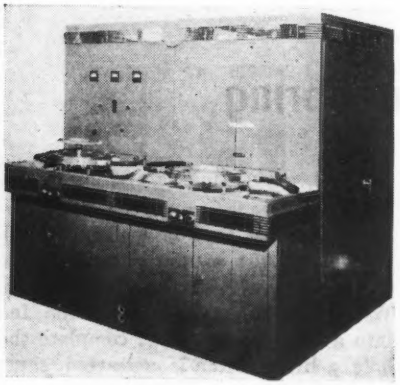


New Equipment . . .

Heat Treating and Furnace Control

. . . Recent developments in heat treating furnaces, induction heating equipment and process control and testing machines are described in the following pages.

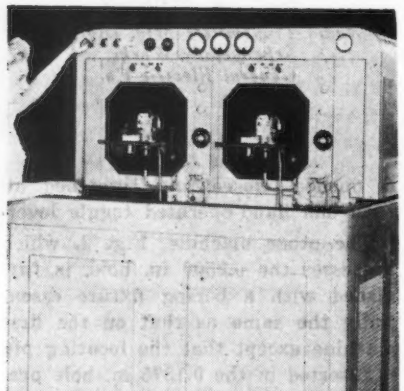
A 50 kw. electronic heater for surface and localized hardening of gears, rods and other parts and for annealing, brazing and soldering op-



erations has been announced by the *General Electric Co.*, Schenectady, N. Y. The heater is available in models rated either 230 or 460 volts, 3 phase, 60 cycles. The heater cabinet is composed of two compartments, one of which contains an air-cooled transformer to step-up power supply voltage to the six rectifier tubes, and such accessory items as a contactor, a tap changing switch and filament transformers. The other compartment contains the high frequency components—a single water cooled oscillator tube and a bank of water cooled capacitors. The two compartments are separated by a protecting partition.

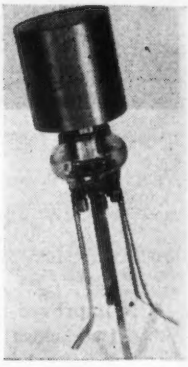
Electronic Heating Machine

A TWO station radio frequency electronic heating machine has been developed by *Ohio Crankshaft Co.*, 3800 Harvard Avenue, Cleveland 1. The machine has a normal frequency of 450,000 cycles and a 20 kw. output capacity. It is said to be the first tube-type unit to be designed with two independent work stations that can be operated at the same or widely different frequencies. The subassemblies of the machine are complete units mounted on beds which in turn rest on flat metal tracks that enable the entire assembly to slide out of the cabinet if necessary. Features of the machine include shock mounting of tubes and power contactors, tube filament voltages held automatically over a wide range of line voltage variation, matching transformers located within the machine and a forced air cooling system.



Power Tube

A POWER tube, designated F-5303, first in a series specially designed for industrial use in high frequency heating equipment has been developed by the *Federal Telephone & Radio Corp.*, 32 Central Avenue, Newark 1. Rated at 3.5 kw., the tube has 6 in. flexible copper leads permanently secured to the tube terminals. Other design features include unusually sturdy, conservatively spaced filament and grid elements and an absence of ceramic insulation both internal and external. An oversize filament insures abundant emmission and an extra-heavy anode wall provides large thermal capacity for added protection against momentary overload. Power tubes operate at full ratings at frequencies up to 40 megacycles. Maximum ratings are d.c. plate voltage 3500 volt, d.c. plate current 1.0 amp. plate dissipation, 1200 watt. The filament current is 27.5 amp. at 11 volt.

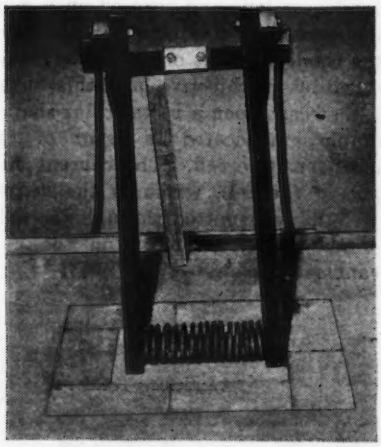


High Frequency Generator

A WATER cooled silent, high frequency generator hermetically sealed within its frame has been announced by *Ohio Crankshaft Co.*, 3800 Harvard Avenue, Cleveland 1. Water enters through the lower water line and circulates within leaving through the upper or outlet line. Resilient mountings prevent any contact of generator and the base. Diameter of the generators of 50 kw. output and up ranges from 33 to 37½ in. O.D. while their length varies from 4¼ to 5 2/3 ft. as the capacity output of the generator increases. Generators come with either sleeve or ball bearings as requirements demand.

Salt Bath Starting Coil

AN electric salt bath furnace coil for "un-freezing" salt baths has been developed by *Upton Electric Div.*, 7450 Melville at Green, Detroit 17. The starting coil consists of a



nichrome heating coil element connected to the output leads of the furnace transformer by two mild steel bars and flexible buses and operates together with the transformer. The coil can be used either before or after the salt in the furnace is allowed to freeze up.

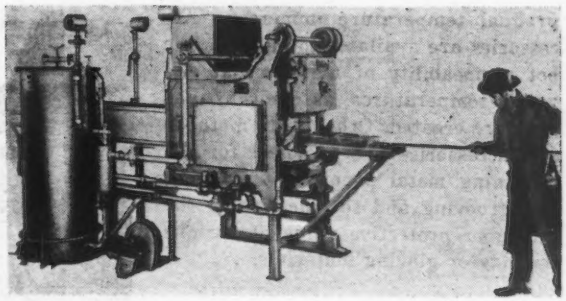
Induction Heating Capacitors

PARALLEL-PLATE capacitors for use in the resonant circuit or "tank circuit" of high frequency electronic oscillators such as those used in electronic-heater equipment, have been announced by the *General Electric Co.*, Schenectady. When connected in parallel with an inductance coil, this class HFP, water cooled capacitor constitutes the resonant circuit which determines the frequency of the oscillator. Low losses at high frequencies, uniformly high dielectric strength, high current rating per unit volume make the capacitors particularly suitable for operation at high voltages. The units are available in standard rating ranges from 2000 volt, 0.025 microfarad to 9000 volt, 0.0056 microfarad. The capacitors use a synthetic dielectric liquid which is chemically stable.

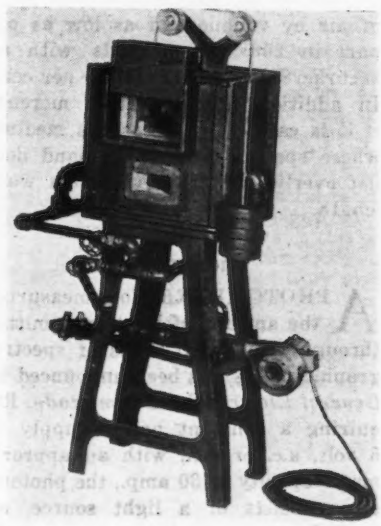
Electronic Recorder-Controller

AN electronic type resistance thermometer suitable for indicating, recording and controlling temperatures between 100 and 1000 deg. F has been announced by *Bailey Meter Co.*, 1050 Ivanhoe Road, Cleveland. The recorder operates on the null balance principle and provides balancing action by electronic detection and control. Reliable performance and accurate calibration over long periods of continuous operation are said to result. The temperature sensitive element is a platinum resistance wire, wound on a mica form.

Electronic Recording Instrument



AN electronic recording instrument that can withstand drop hammer vibrations and still maintain a sensitivity of 6 points in 10,000 has been announced by *Brown Instrument Co.*, Philadelphia, Div. of Minneapolis-Honeywell Regulator Co. Earlier models of this instrument have been used successfully in the production of high octane gasoline, butadiene, styrene, plastics, ball bearings, aluminum and other wartime products. The improved models can be operated upside down as well as in an upright position.



Multi-Purpose Furnace

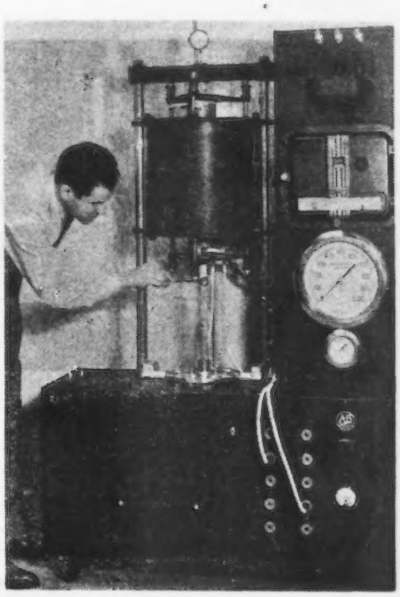
A PEDESTAL type, heat treating furnace which provides three heating areas in the one installation has been announced by *Barkling Fuel Engineering Co.*, 400 North Paulina Street, Chicago 22. It has an indirect chamber with a door opening of 4½ x 8 in. for hardening, annealing, stress relieving and carburizing, a direct heat chamber for heating for tool dressing, forging and bending with opposed 2 x 4½ in. openings in front and back and a tempering surface on the top for tools and dies. Temperatures up to 2500 deg. F. are obtained in the direct heat chamber and up to 1900 deg. in the indirect heating chamber.

All Purpose Brazing Furnace

DESIGNED for silver brazing at low temperatures, copper brazing at high temperatures, powder metallurgy, bright annealing, general tool hardening and high-speed tool hardening, an all-purpose furnace has been announced by *Lindberg Engineering Co.*, 2444 West Hubbard Street, Chicago 12. Working temperatures range from 1300 to 2500 deg. F. Hydryzing atmosphere, precombusted gas and dry hydrogen atmosphere can be used for prevention of oxidation and discoloration. The furnace is protected from the infiltration of outside air by the use of a flame curtain at both the charge and discharge door of the furnace. The curtain ignites automatically when the doors are opened which is a further protection against oxidation.

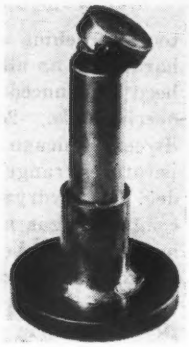
Dilatometer

EQUIPPED with a furnace that will operate between the temperature ranges of 500 to 3000 deg. F., a dilatometer for high temperature testing has been announced by *Harry W. Dietert Co., Detroit*, 4. The test specimen most commonly used is 1⅛ in. diameter and 2 in. long. Both free and confined expansion or contraction tests of the specimen are readily obtained either for thermal shock or gradual temperature rise. The dilatometer can also be used for spalling tests for either shock or



gradual temperature immerson. Accessories are available to measure the hot permeability of materials at elevated temperatures as well as gas pressure created. Other tests methods and accessories are provided for determining metal penetration, veining and grooving and for measuring the facing or protective value of various foundry or glazing materials.

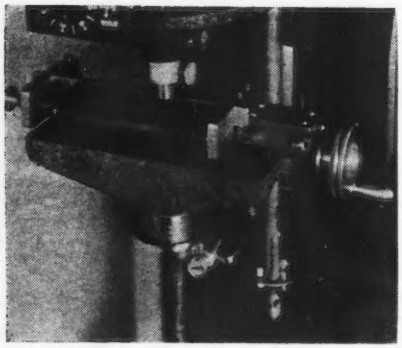
Jominy Specimen Holder



A SPECIMEN holder, consisting of a stainless steel shell with a cap, for making Jominy end-quenching hardenability tests has been announced by *Claud S. Gordon Co.*, 3000 South Wallace Street, Chicago 16. The specimen to be tested is put inside the shell and heated in any furnace. After heating, the shell is placed in the base assembly. The pin in the bottom of the base pushes up the specimen, causing the cap to fall off. The sample can then be removed and quenched in the Jominy tank.

Jominy Hardness Fixture

AN indexing fixture for Jominy hardenability bars has been announced by *Precision Scientific Co.*, 1750 N. Springfield Avenue, Chicago 47. The fixture consists mainly of a heavy rigid base casting, an indexing screw and a quick return mechanism. The fixture mounts readily on either the Clark or Wilson hardness testing machine.



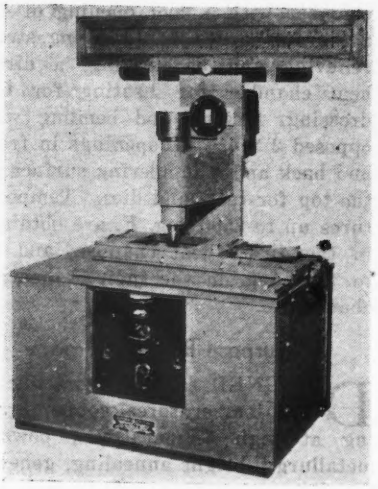
Mercury-Vapor Detector

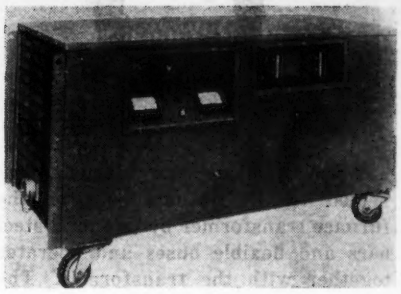
AN electronic detector for detecting the presence of mercury-vapor concentrations in the atmosphere has been announced by *General Electric Co.*, Schenectady. Designed for use in the glass, chemical, smelting, metal

mining and electric apparatus manufacturing fields where mercury-vapor concentrations must be kept below the toxic limit—1.2 parts mercury vapor in 100,000,000 parts of air by volume—the detector will measure directly mercury-vapor concentration as high as one part in 3 million parts of air by volume and as low as one part in 200 million parts with an accuracy of approximately 5 per cent. In addition it will detect mercury if it is carried by a gaseous medium whose spectral absorption band does not overlie the 2537 Angstrom wave length.

Photometer

A PHOTOMETER for measuring the amount of light transmitted through very small areas of spectrographic plates has been announced by *General Electric Co., Schenectady.* Requiring a constant power supply of 6 volt, a.c. or d.c., with an approximate capacity of 30 amp., the photometer consists of a light source, an optical system, a galvanometer, a light sensitive cell and a mechanical stage for accommodating the plate. When measuring the light transmitted through a plate, the instrument is mounted on the mechanical stage and light from a projection lamp in the optical system is collected by a condenser lens and focused on a wide aperture lens, producing an image of the condenser lens on the plate. Magnified by an objective lens, this image is then cast upon a rectangular shaped diaphragm located in front of the light-sensitive cell. The current output of the cell, which is the degree of light transmitted through the field of the plate, is shown on the galvanometer scale.



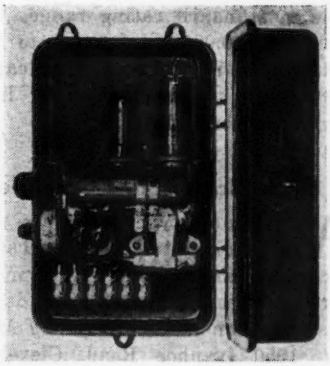


Magnetic Testing Rectifier

A RECTIFIER unit for magnetic testing has been announced by *W. Green Electric Co.*, 130 Cedar Street, New York 6. The unit has a continuance capacity of 1500 amp. d.c. with proportionately higher rating for intermittent operation. The output voltage is adjustable in eight steps from 1 to 6 volts. A fan-cooled selenium rectifier assembly is the heart of the unit. Louvers at each end provide for air intake and exhaust.

Electronic Concentrate Control

FOR detecting and controlling through operation of signals, valves or pumps, changes in liquid concentrations, and electronic concentrate



control has been announced by *Photoswitch, Inc.*, Cambridge 42, Mass. It provides control for all applications in which changes in concentration are accompanied by a corresponding change in electrical conductivity. One application of the control is in the detection of contamination in boiler condensate.

MACHINE DESIGNERS CAN TAKE A TIP FROM THE USE OF OILGEAR TRANSMISSIONS IN AMERICA'S NEWEST, MOST EFFECTIVE ANTI-AIRCRAFT GUN

A typical example of the almost unlimited flexibility of Oilgear Fluid Power, the things you can do with it, is the highly successful use of Oilgear Transmissions in America's newest and most effective 40 M M anti-aircraft guns. Two Oilgear Transmissions serve each gun. One moves the carriage from side to side, the other elevates the gun muzzle. The two transmissions are self-synchronizing and work automatically on signals from the director-mechanism. Enemy planes may come in from any direction, at tree-top level as well as at great heights. Hence, these Oilgear Transmissions provide rapid slewing and elevating speeds with precise, rapid and accurate deceleration as the gun centers on the target, and appropriate following speed. Plane evasive tactics are met by variable synchronization of the two directions of travel. Easy and speedy disengagement and re-engagement of automatic operation is also provided. These Oilgear transmissions are small, powerful, dependable.

In the functions outlined above, or elsewhere in the wide range of characteristics of Oilgear Fluid Power you are almost certain to find a better solution to the problem that confronts you. Write for further information or put your problem up to Oilgear Engineers. Do it *now*. . . . THE OILGEAR COMPANY, 1303 West Bruce Street, Milwaukee 4, Wisconsin.

External view of Oilgear new, smaller, efficient, high speed transmissions as used on newest 40 MM anti-aircraft gun control system which also incorporates travel limit switches, unlimited azimuth angle and increased elevation angle, push-button controlled high-speed slewing, increased torque and speed of operation.

ARE YOU TRYING TO:

1. Apply large forces through long . . . or short . . . strokes at variable speeds?
2. Obtain automatic work cycles, variable speeds in either direction . . . with or without pre-set time dwell?
3. Apply large forces through continuous or intermittent reciprocating cycles at constant or variable velocities?
4. Obtain extremely accurate control of either position or speed of a reciprocating member?
5. Apply accurately variable pressure either static or in motion?
6. Closely synchronize various motions, operations or functions?
7. Apply light . . . or heavy . . . forces at extremely high velocities through either long or short distances of travel?
8. Obtain continuous automatic reversing drives at constant R.P.M. or over a wide range of speed variation?
9. Obtain accurate remote control of speed and direction of rotation, rates of acceleration and/or deceleration?
10. Obtain constant horsepower output through all or part of a speed range?
11. Obtain automatic torque control?
12. Obtain accurately matched speed of various rotating elements?
13. Obtain constant speed output from a variable speed input?
14. Obtain full pre-set automatic control, elimination of problems of shock, vibration, etc.?

You Need Oilgear!

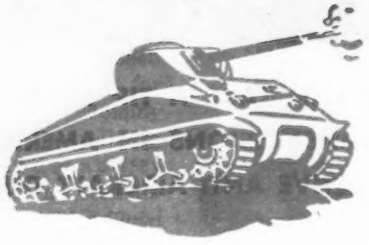
OILGEAR

Fluid Power

Assembly Line . . .

STANLEY H. BRAMS

• WPB is taking steps to solve shortages in castings, in bearings, and in cylinder sleeves . . . Meanwhile, manufacturers find postwar planning is being stalemated by the lengthened promises on machine tool deliveries.



DETROIT—The weight of war goods emphasis since December has driven thinking about postwar production underground, where it is still functioning rather feebly but continuously. Meanwhile, new war contracts continue to hold the center of the stage here.

There is the start of a suspicion evident among automotive men that the military may be overreaching itself in current ordering, but there is no disposition to question any of the orders on the grounds of ultimate need—not after the December materiel scare, anyway. As a matter of fact, the military may not be entirely at the root of the present large scale ordering. The War Production Board stood out against the Army for large-scale, longer term orders, figuring that the psychological advantages applicable to war output, the comparative economy of planning for longer term runs, and the outright possibility of need for those longer runs all combined to outweigh by far the disadvantages inherent in widespread contract cancellations which would come whenever the European war concludes.

War contract schedules continue to run late in the automotive community, and the WPB is undertaking to find out where today's pinches are located and what can be done to correct them. The Automotive, Shipbuilding and Power Divisions, for instance, have sent out Form 4031 to internal combustion manufacturers, asking for listings of castings requirements for cylinder heads and blocks. When this information is tabulated it will be checked against foundry schedules on engines. The WPB Steel Division will then make recommendations as to transfer of work among foundries of expansion of foundry facilities to meet deficits.

As for bearings, Cleveland Graphite Bronze, Detroit Aluminum and Brass, Bohn Aluminum, Federal Mogul and Moraine Products are furnishing the Navy's Engine Parts Coordinating Office with orders on hand, and these tallies will be reconciled with requirements. Figures thus far indicate total need for about 18,000,000 bearings monthly for all requirements, compared with production among the five major companies enumerated of 12,800,000 monthly, and potential production, with full manpower, of about 15,200,000.

Cylinder sleeve requirements, also short, may be relieved soon by reopening of a closed foundry at Ford Motor Co. to spin these castings in long production runs. This will relieve Sealed Power Corp., Muskegon, Mich., which has been unable to squeeze short runs into its lengthy production schedules. In addition, machining facilities at White Machine Co., Eau Claire, Wis., will be expanded, with $50,000 in requisite machine tools located to equip the expansion. This will augment White output by 20,000 to 40,000 monthly in the next few months. Campbell, Wyant & Cannon Foundry Co., Muskegon Heights, Mich., will furnish White with rough castings.

CHAPTER and verse on WPB's problems and solutions also encompass a wide variety of situations developing from basic shortages. Schedules on the GMC 2½-ton six wheel drive dump truck fell behind about 15 per cent because of lack of enough Gar Wood winches from St. Paul Hydraulic Hoist Co. and White Motor Co. The winch shortage, in turn, derived from an inadequate flow of some of 150 components, particularly castings. Reo Motor Co., also working on a dump truck of similar size, fell 37 per cent behind forecast because of manpower shortages and transmission troubles.

These are bottlenecks; naturally production flows better through most channels. An interim report by General Motors this past week-end revealed a rather impressive list of production totals by classifications. Since the start of the war program in 1940, G.M. has produced 140,000,000 shells and shell casings, 180,000 cannon, 1,000,000 0.30 and 0.50 cal. machine guns, 2,400,000 carbines, 180,000 airplane engines, 9,000 complete bombers and fighter planes, 31,000 tanks, tank destroyers and armored cars, and 740,000 trucks, including amphibious ducks. In addition the company has built a "major part" of all the Diesel engines produced for the land and sea arms of the forces. In all, the report pointed out, General Motors manufactures some 3600 items for the services.

'CYCLE HALF - TRACK: *Captured German equipment is a source of never ending curiosity for American soldiers on the western front. This personnel carrier started out as a motorcycle.*

Meanwhile there is no gainsaying the fact that the manufacturing community, in Detroit and elsewhere, is devoting a small portion of its thinking to postwar planning. Although such thinking has gone underground, as was stated, it is nourished not alone by desire, but by feeling on the part of many executives that military demands may become as slack a few months from now as they are bursting today. This is not necessarily expected, but it can conceivably occur, and if it does preparedness will be worth its weight in gold, community wise and profitwise.

FULFILLMENT of those postwar plans is, however, receiving current setbacks. Machine tool builders, for instance, have extended delivery promises to automotive sources from

"This stuff's pretty fussy . . . give it to a shop with Pratt & Whitney Equipment"

It stands to reason that, all other things being equal, *the better equipped a tool shop is, the better it can satisfy you on quality and accuracy.*

The manufacturer who buys tools, dies, jigs, fixtures, and other precision equipment from a shop using Pratt & Whitney machine tools, small tools, and gages can expect just that much more quality and precision in anything they make for him.

And the chances are that Pratt & Whitney equipment will not only do the job better, but do it *faster.*

This is a tip worth heeding . . . whether you need new tools now, or for reconversion later on. For 85 years wise manufacturers have proved to their own satisfaction that the name Pratt & Whitney stands for accuracy and dependability second to none.

Typical of the many P&W machine tools found in any well-equipped shop is this Jig Borer—one of the finest precision machines ever built. Designed specifically for the particular job of precision boring, this machine also can be used as a "jig eliminator" on small lot precision manufacturing. Write for full information on this and other Pratt & Whitney toolroom equipment.

PRATT & WHITNEY

Division Niles-Bement-Pond Company

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four to six months beyond the dates set up last fall. And, of course, these latter dates are highly tentative, because under the recent near-abrogation of Priority Regulation 24 no unrated machine tools can be delivered unless they were nearly completed, nor can any new unrated machine tools be started in production. The reconversion programs of automotive companies whose preliminary stages began to develop so nicely last year have lapsed into desuetude today.

Furthermore, machine tool companies have largely suspended development work on new postwar products. Even though manpower may be available to undertake such work, the equipment makers hesitate to assign it to development projects out of fear that War Manpower Commission manpower ceilings on their shops will be lowered.

The distaste being manifested by the machine tool makers for development and production of this sort has created a dilemma of real proportions for many of the automobile companies. They are damned if they do and damned if they don't. They feel they must go ahead today and specify and order postwar machines now. But the really advanced designs are not ready today, as they might otherwise have been; expectations of appearances of these machines sometime this summer and fall have been modified by about a year, which means they will not come out in some instances until late in 1946. So the only machines that the automotive companies can order are fairly well proved types of the sort produced before the war. If they don't order, their postwar manufacturing lines will have gaps in them. If they do order, they will be strapped by a capital goods investment which must be used for several years in order to liquidate its cost, and the new advantages which will be introduced later will be missing from their shops.

Engineers Consider Precision Casting Costs, Techniques

Detroit

• • • Techniques and problems involved in precision casting were outlined at the February meeting of the Detroit Section of the American Society of Mechanical Engineers by R. M. Kerr, Jr., of the Kerr Dental Manufacturing Co.

Kerr stressed that all pieces are not suited, either by nature or quantity of production run, to precision casting. In all, Kerr declared that four factors should be considered in designing for precision casting—the tolerances required, the metal of which the piece is to be made, its shape, and its production volume.

For comprehensive discussion of production methods employed at Kerr Dental Manufacturing Co., see "Equipment and Material for Precision Casting," by J. Albin, THE IRON AGE, *Nov. 9, 1944, p. 52.*

Although tolerances around 0.002 in. can be achieved with good precision casting, he pointed out that shrink is a problem which must be compensated in the design of the mold, and that shrink is uniform throughout the piece. If the critical dimension is in a narrow neck and also along the length of the neck, uniform shrink throughout will create many problems. Small parts, therefore, are generally more suited for precision work; to date pieces weighing up to 5 lb. or so have been found well suited for precision casting.

Sometimes, in designing for precision casting, minor changes can be made which permit better location of shrink pipes. Consideration should also be given the mold and the investment to be used.

Under the factor of metal should be considered such factors as its type, the hardness required, the heat treat planned, the surface finish specified, and its meltability.

As for production volume, quantity and cost relationships are major problems. A comparatively simple piece needed in large quantities would probably be more economically produced by orthodox machining methods. A complicated piece specified in limited amount may likely be produced more efficiently by precision casting.

Pullman's Freight Car Output Increased 25%

Chicago

• • • Although 75 per cent of its 1944 production was war material, Pullman-Standard Car Mfg. Co. also completed 8060 of the 40,392 freight cars built throughout the country for Class 1 railroads during 1944, according to Wallace N. Barker, vice-president. In addition to the freig car production, which was 25 per cent higher than the 1943 total of 6429, the company produced 173 street cars and 63 trolley buses, 60 per cent and 100 per cent, respectively, of the country's output in these categories.

Pullman-Standard's backlog of domestic freight car orders on Jan. 1, 1945, was 8265, compared with 5191 the previous month and 5514 a year ago.

Production of freight cars for export during 1944 amounted to 10,880, all but 200 of which were for the War Department. In 1943, 10,974 cars were built for export.

War goods delivered during 1944 by Pullman-Standard included aircraft wings and major subassemblies, patrol vessels and landing craft, shells, mortars, howitzers, 155 mm. rifles, carriages for 3 in. and 240 mm. guns, and transport wagons for 240 mm. guns.

CHINA BOUND: *At Myitkyina, the motors, tires and gas supply of these jeeps are checked before they start on the final phase of the journey over the Stilwell Road—the first convoy since the Jap invasion of Burma in* 1942.

Here's Your 3-step plan for

BETTER TOOLS TO CUT PRODUCTION COSTS

Use this sure way to knock the props from under production costs. Let Carpenter help you put this three-step plan to work in your tool room and heat treating department. With it you can reduce machine down-time and actually lower unit costs.

1. Cut The Cost Of Tooling-Up And Reduce Machine Shut-Downs!

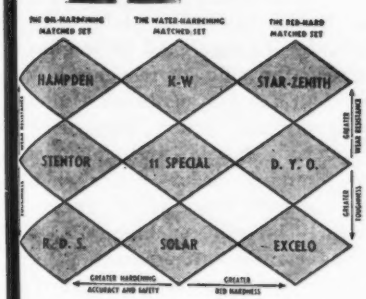
It's no trick at all to make sure of selecting the proper tool steel for each job when you use the Carpenter Matched Set Method. Many plants use this method of selection to lick production problems caused by premature tool and die failure. And it works! Now tool makers who have used it are relying on it to get *every* job done right. They know it cuts the cost of tooling-up and reduces machine shut-down time. And those savings are bound to show up in the cost of the finished product.

2. Insurance That Each Tool Will Pay-Off On The Job!

As you know, proper heat treatment is the second step to seeing that each tool is made to do its job right. And the Carpenter Heat Treating Guide quickly gives you this important information about each Carpenter Matched Tool Steel: Type analysis, Forging heat, Normalizing heat, Annealing treatment, Hardening treatment and Recommended drawing range. And this slide chart gives you tips on quenching, oxidizing atmospheres, heating time and heating speed for drawing. For your free copy, drop us a note on your company letterhead.

3. Check On Tool Life And Output Per Grind!

Find out which tools and dies need too frequent regrinding or fail prematurely in service. Carpenter Matched Tool Steels can help you lick this condition, and reduce unit costs. And for personal help in your tool room or heat treating department, get in touch with your nearby Carpenter representative. He knows tool steel inside-out, and can often provide the kind of engineering help that licks tough production bugs.



How the Carpenter Matched Set Method Helps to Solve Your Tool Steel Problems...

These are really Matched Tool Steels, as one picks up its job where the other "leaves off."

The key steel is the one in the center, *No. 11 Special,* a straight carbon, tough timbre, water-hardening tool steel. When you have a tool to make, you first find out if it can be made from *No. 11 Special.* If the answer is "Yes", you go no further. But when the answer is "No", you use the diagram to point the way to the tool steel that will do the job. For greater *wear resistance* you go north. For greater *hardening accuracy* and *safety,* you move west, etc.

To learn more about the ways this method can be used in solving *your* special problems, ask for a copy of the 167-page Carpenter Matched Tool Steel Manual. It contains an 80-page tool index and steel selector that many tool engineers find extremely handy. For your copy, write us a note on your company letterhead, indicating your title. (Free in U. S. A.)

The Carpenter Steel Co., 121 W. Bern St., Reading, Pa.

Carpenter MATCHED TOOL STEELS

Washington . . . L. W. MOFFETT

• Investigation at Ft. Ord shows diminutive Japanese weapons to be deadly, though flimsy appearing in comparison to American Ordnance... "Knee mortar" is most unusual and effective of group.

WASHINGTON — American technical intelligence plus the experience of United States fighting men shows that Japanese weapons while of shorter range than American guns are quite effective despite their sometimes comical appearance.

A report made by an officer at Fort Ord, Calif., says:

"On the whole Jap guns are smaller than ours, lighter and less accurate at extreme ranges. Obviously they have been designed to accommodate the Nips squat stature; the short rifle and light machine gun stocks—the low shoulder rest on the 20 mm. anti-aircraft, anti-tank gun—the small dangerous knee mortar (perhaps their most valuable and certainly their most revolutionary weapon.)

"Even their hand grenade is smaller and the legs of their three-meter height finder tripod are stubbier. At first glance these miniature instruments of death look like toys, until you try them and test them and learn how effectively they can spit death."

Ordnance observers in the Pacific say that if the Japs can see you they can hit you, by way of complimenting the enemy on their marksmanship with field artillery in one way and knocking Jap accuracy when fire control is employed. It is reported that the Japs are excellent mortar marksmen.

The knee mortar is not a knee mortar. It was so named mistakenly by Army men when it was first captured because of the peculiarly shaped spade at the bottom designed to be implanted in the ground or against a tree, not on the knee. A Marine sergeant on Guadalcanal who had captured one, proved the misnomer by trying the mortar against his knee; it broke his leg.

What do men under the knee mortar's fire think of it?

One Marine sergeant in the Solomons wrote his commanding officer:

"Tell the Army to watch that knee mortar—it's dynamite!"

A Captain back from the Aleutians said: "Every time you drop, roll away 20 ft. or so; every time you take cover, move into deeper cover. They can drop those knee mortar grenades on a dime."

The mortar grenade itself is practically an artillery shell. It is fuzed with a point detonating, safety-pin type fuze which screws into the nose, ballistics men report. It is, in effect, a cast metal, hollow projectile—packed full of TNT. The rotating band at its base expands when the propelling charge escapes through the ports in the bottom of the grenade and the bands grab and twist the shell as it passes through the tube. Rotation renders the grenade stable and accurate in flight. The high explosive cavity is something less than 50 mm. in diameter and about three inches deep.

The report said:

"Two men constitute the crew of the knee mortar. As the piece only weighs 10½ lb.—as two men can fire it at a rate of 20 rounds per min.—as each round throws more than ¼ lb. of TNT 700 yd. with almost rifle accuracy—Western Defense Command Base Field Shop Ordnance Officers consider this heavy grenade launcher the most original and deadly of all Japanese weapons.

The story on Jap rifles and machine guns in comparison with American models is the case of good big guns outshooting in range good little guns. The latest Jap rifle, more than 1 lb, lighter than any gun made for United States Army use, is not effective beyond 350 yd. The Jap light machine gun is similarly accurate for short ranges, but falls down at the greater distances. The light machine gun and rifle use the same caliber ammunition —.303 and it makes them more effective than the 25 caliber rifles and machine guns originally used by the Japanese.

Another officer returned from ac-

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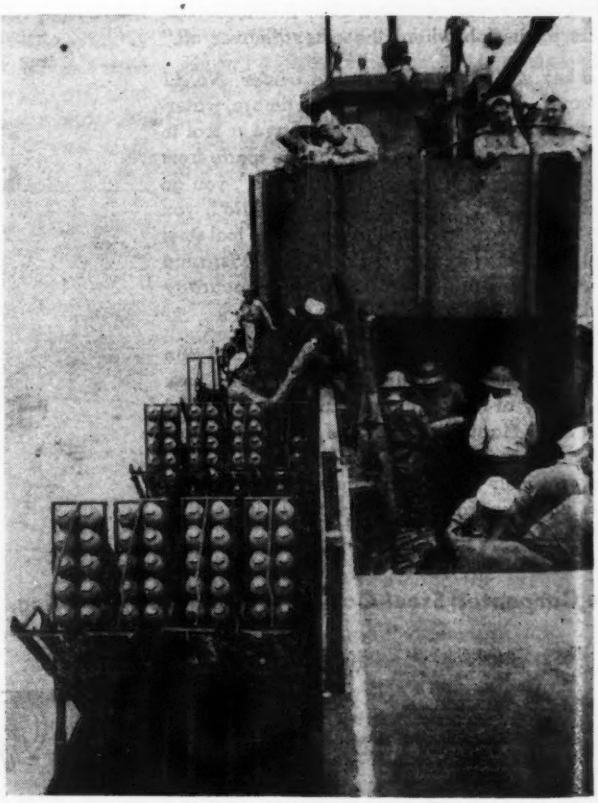


LCI WITH A PUNCH: *Portable racks for rockets on this Landing Craft Infantry make it a formidable warship. Light and easily set up, the racks and their missiles have added tremendously to the firepower of U. S. Navy task forces. Some landing craft carry potential firepower more than twice that of a battleship.*

o o o

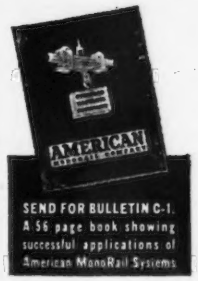
MOTORIZED HANDLING

Assures Low-Cost Assembly!

When all handling is done mechanically, as with American MonoTractor drives for cranes and hoists, unskilled help can spot heavy or cumbersome loads accurately and safely. In aircraft plants this kind of handling enabled inexperienced labor to complete highly technical assemblies.

Motorized equipment can be easily and inexpensively adapted to a wide variety of handling problems. Quite a number of automatic systems have operated successfully for the past five years by remote control between departments or from building to building.

An American MonoRail Engineer will gladly show how such systems have eliminated handling costs in assembly operations. Write today —no obligation.



THE AMERICAN MONORAIL CO.

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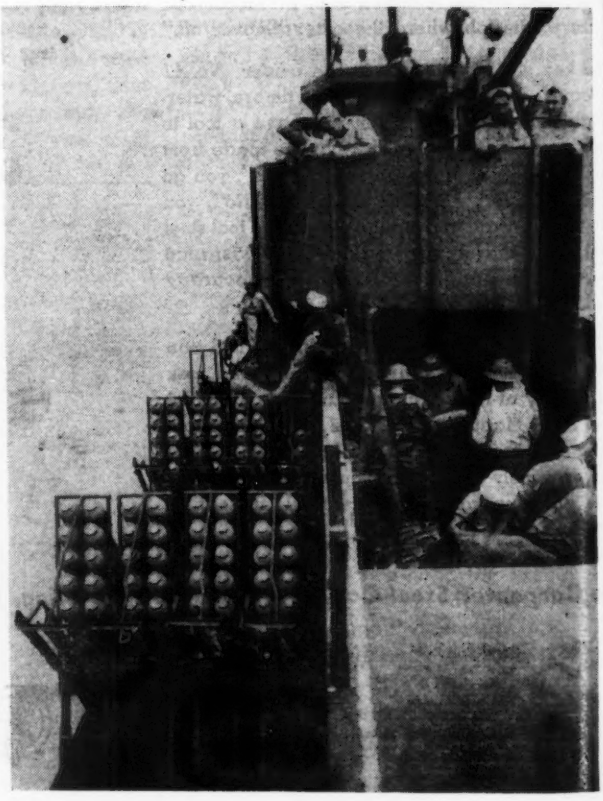

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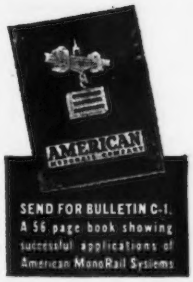


THE AMERICAN MONORAIL CO.

13103 ATHENS AVENUE, CLEVELAND 7, OHIO

tion in the Aleutians, agrees as to the effectiveness of the knee mortar, but substitutes the 20 mm. anti-aircraft, anti-tank gun for the next most worrying Jap weapon. He pointed to it sitting on its antiquated wooden-wheeled mount where it looks so awkward, ancient and ineffective.

"They take the wheels off—spread the outriggers 120 deg. apart and spike them down. Sure it's light—but they have to manhandle it, don't they? Drag it up and over the wildest country you've ever seen!"

"They had one of those devils pulled up a 3000 ft. mountain. Our orders were to take the pass. Well—we took it. We took it twice, and they shot us out of it twice with 20 mm. high explosive shells. Yes, we took it the third time—we were ordered to take it, weren't we? When we reached the top we found that gun—sitting there just as silly looking as it is now—four dead Japs around it * * * * nothing but dead Japs and that foolish looking gun.

"Some people laugh at it, I guess. Somehow, it isn't very funny to me."

This Japanese 20 mm. gun,—Oerlikon type—fires armor piercing as well as high explosive shells. It is a gas operated, aircooled magazine fed weapon. Maximum horizontal range is 5450 yd. and maximum vertical range is 12,000 ft.—five times less than the most efficient United States anti-aircraft weapon. One weapon captured on Attu supplied an amazing climax to the tests at Fort Ord, the report said. It was a mortar—obviously—with a fixed firing pin centered in the base. The tube 70 mm. in diameter—without lands and grooves and was screwed into the base which was secured by bolts to a supporting block of hardwood.

A pointed spike at the bottom of the base extended through the hardwood supporting block and into the ground when the piece was emplaced. There was no provision for elevating or swinging this piece around once it was implanted.

The logical assumption then was that the piece was a barrage mortar, varying its range in depth by changing the number of propelling powder additions. The first round fired disproved that or any other apparently reasonable conjecture.

The projectile was an enigma itself. No mortar shell ever seen by United States Army Ordnance officers resembled this black cylinder, 11 9/16 in. long, with a flat unfuzed top—and a small brass primer centered in the flat bottom. There was nothing in the world like it. The top was riveted on —the bottom was soldered. The only way to examine it was to fire it.

The projectile was dropped into the muzzle of the mortar. With a great puff it rose into the air 1500 ft. and at its maximum elevation, literally blew its top. Seven metal cylinders 8½ in. long were shot free from the case—and each of these ejected with a fire-cracker-like pop a three inch black cylinder suspended from a paper parachute. The sky was filled with miniature parachutes.

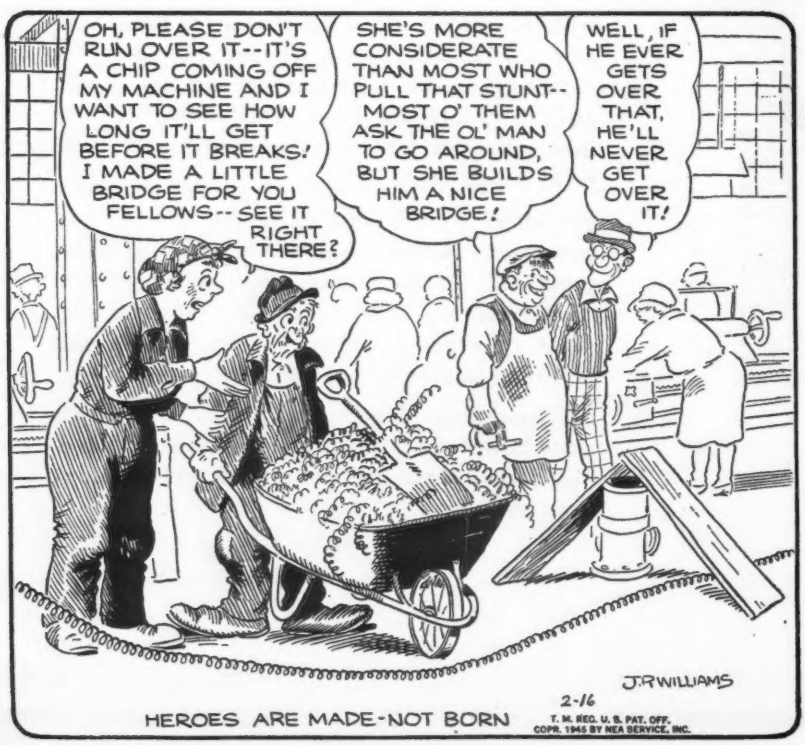
It seemed that the Lilliputian paratroops were descending to invade California, the report said. Sixteen separate parts of that strange projective drifted gently to earth. Nine of them were harmless—the shell case —the shell top and the seven metal containers.

But the remaining seven, those 3 in. black cylinders ⅝ in. in diameter, with the white Japanese characters painted on them so attractively—were deadly booby traps. The string that suspended them passed through a bit of silk cloth and into the top of the cylinder. Pull that string—and the booby trap would explode.

The Ordnance officer concluded:

"Fantastic? Not at all. Simply the Japanese comment on the curiosity of the American soldier. Already there is one Alaskan casualty on record from this strange Oriental conception of the contraptional booby trap."

THE BULL OF THE WOODS — BY J. R. WILLIAMS



Steel Statistics Prepared

Washington

• • • To aid steel mills in determining what part of their total production is going into war use and therefore subject to renegotiation with the War Contracts Price Adjustment Board, WPB has announced that it is compiling information on the tonnages of steel that steel warehouses shipped in 1944 to war procurement agencies. WPB's steel division is also preparing estimates on the amount of steel shipped by the mills last year for further conversion as well as the overall portions of finished product shipments applicable to the war procurement agencies.

WPB pointed out that steel mills, of course, can account for their direct shipments to the war agencies but it is only through its Steel Division records that the indirect shipments can be traced. This information was furnished to the War and Navy department price adjustment boards in 1943 and subsequently to steel companies.

It is expected that a similar notification of the steel industry will be made by the Steel Division in the early part of March.

The Sheffield **THREDCHEK** provides a more *specific* and *accurate* check of critical thread elements than the conventional *collective* check.

Two GO rolls serve to pass parts that are not oversize and which *will* assemble. These rolls screen out parts which are oversize or which will not assemble because of an excessive error or combination of such errors in lead, angle and pitch diameter.

As the parts are passed from the GO or assembly rolls and are presented to the two NOT GO rolls, one of which is mounted so as to actuate a dial indicator, the dial shows whether the pitch diameter is too small and *by how much*. Should the pitch diameter show as being within tolerance limits and near basic, then it can be assumed that lead and angle are not only within tolerance limits but are also of the highest dimensional quality.

A free-rotating backstop enables the part to be properly located for accurate checking and also permits checking for out-of-round. The backstop, together with the indicator, eliminates the need for a trained sense of "feel" in making the NOT GO check—a most important advantage of the THREDCHEK.

Both sets of rolls are PRECISIONPLATE—Sheffield precision chrome plate—for longer life. Full manufacturing tolerances may be utilized because wear allowance is compensated by adjusting the rolls on their eccentric axis. The open end style permits checking close to a shoulder.

THREDCHEKS are available in frame sizes corresponding closely to Sheffield Thread Roll-Snap Gages, with standard or special pitch rolls. *Write for engineering data "Instruments #8".*

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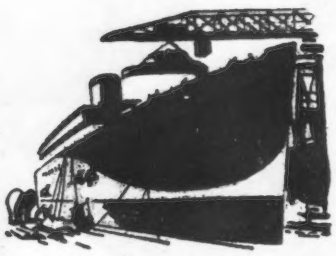
West Coast . . .

OSGOOD MURDOCK

• Columbia Steel Co. realizes its fondest hope in U. S. Steel's commitment to bid for, operate and integrate Geneva plant . . . Kaiser announces his interest in Geneva and his substantial ownership of Fontana.



LOS ANGELES—It all started out to be just another conference. It was arranged by Chamber of Commerce secretaries from principal Pacific Coast cities, who, with a few of their principal local heavy industry members, were to meet at Salt Lake City. They were to present and agree on basic data and to crystallize regional unity among business and commercial interests especially those involved and dependent upon a lower differential in the cost of raw and semi-finished steel products in the far West after the war.

Even before the meeting opened with a tour of the Geneva Works by all in attendance, so great had been the interest and stimulus that the United States Steel Corp. had placed itself on record as anxious to bid for the Geneva plant postwar (and the Fontana plant, too, if it should be "no longer needed for present or future war efforts"). In the event of such purchase, B. F. Fairless, president, gave advance notice and assurance to the chairman of the Defense Plant Corp. that the properties acquired would be operated as part of the Columbia Steel Co., and "at as high a rate of capacity as would be warranted by the market for their products in the territory naturally served by their facilities." Furthermore, Mr. Fairless pledged publicly that "such acquisition . . . would be accompanied by reductions or displacements in existing capacity (elsewhere), so that our basic steel-making capacity would not be increased in the postwar period."

That definite, significant contribution to the endless discussions of far Western steel possibilities eliminated a mass of speculation and uncertainty and put the Corporation, builder and present operator of the plant, definitely on record. It is fairly common knowledge that a pretty heated rivalry and contest has gone on for many years within the councils of United States Steel as to where and under which subsidiary plant, expansion and additional manufacturing facilities shall be placed.

Columbia Steel Co., operating in the entire area west of the continental divide, is at the same time a producing company on certain staple products, and a selling and distributing organization for all the products and subsidiaries of the corporation. Every additional ton that Columbia produces represents one less ton that some other division sells in the far Western market. Therefore, Mr. Fairless' unequivocal commitment appears to indicate a notable triumph for and acceptance of the long-held views of Walther Mathesius present able president of the Geneva Steel Co., and William A. Ross, energetic and popular president of Columbia, who has worked and pleaded for this turn to the far West for many, many years.

Casual and conditional reference by Mr. Fairless to the possibility of discussing with DPC representatives the purchase of the Fontana plant produced a rejoinder from Henry J. Kaiser which eliminated more uncertainties, placed more basic data and quite an aura of noble objectives on the already teeming table, and relit fires of competitive animosity that had cooled during the past year.

"The Kaiser Co. has now allocated . . . sufficient assets . . . to pay one-third of its loans to RFC from other sources independent of any steel plants earnings, and Fontana is not and will not be for sale.

". . . Fontana . . . will require some $37,000,000 additional investment to provide facilities to manufacture strip and otherwise prepare the plant for the most efficient peacetime uses. On or before V-J Day the Kaiser Co. proposes to finance the needed capital from such sources . . . as any corporation . . . acquires its financial strength, and it will quite possibly include shipbuilding and r pairs. . . ."

Mr. Kaiser further stated that th Kaiser Co. is now furnishing co "from its mine in Utah," at the ra of 1500 tons a week, to the Gene plant, formerly by directive and no by contract, and that a study is no being made of Geneva (by the Bra sert organization, presumably) to d termine "whether Geneva would be complement to the Fontana mill, o to the West." If it is so found, th Kaiser Co. wants an opportunity t bid for the purchase or lease o Geneva.

In an amplification of his objective and business philosophy, Mr. Kaise hopes to make his steel operation contribute to employment, real com petition, decentralization of power i industrial organization, independen industrialization of the West an South, and a general economy o abundance, production and prosperity "We want a unified America," he con cludes, "not a regional America. . . How can we plan to help China whe we have not yet developed our ow fair land to its real potentials. I all we want to do is make big indus try bigger and consolidate concentrat ed controls, we will go back to wha we had."

With this general statement an point of view all office holders an most average good citizens will agre but hard-headed practical, exper enced steel men still want indisputabl economic facts to prove that it ca and will work in assuring the perma nence of the Fontana plant in its loca tion, with its assets and liabilities under its present ownership and hith erto indefinite future sales policy. It ultimate primary market must b southern California, with the balanc of the Pacific Southwest as secondary

A zealous and unprejudiced report er has yet to find a single substantia consumer of mill products, other tha the Kaiser organization itself, which seems to have present confidence tha Fontana can or will produce and sel its products postwar to compete with intercoastal shipments from Eastern mills or with older tidewater Coast mills producing from low-priced scrap That impression still persists here that Kaiser will be disposed to com pete with any substantial customer by adding such secondary operations as shipbuilding, railroad equipment household products and other fabri

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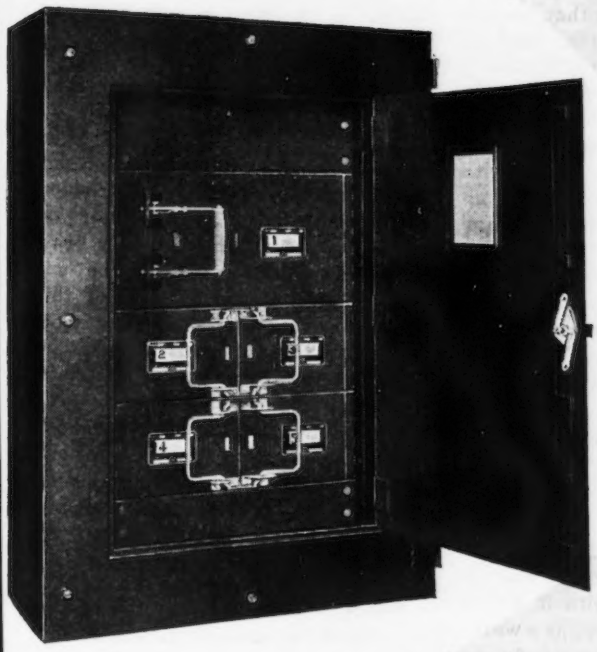
for safe, flexible control of electric service and feeders supplying current for power and light

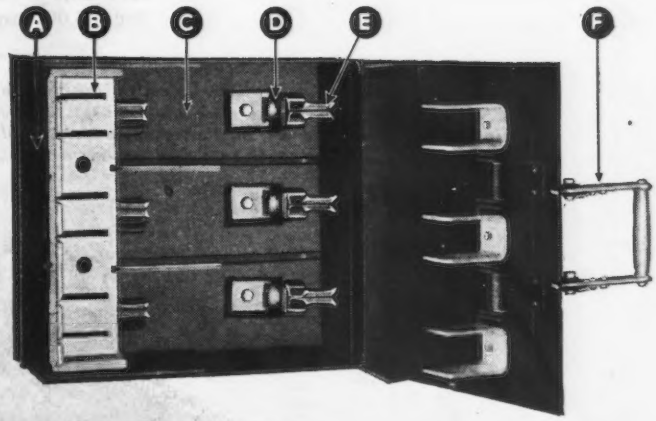


At lower right: *notice the exceptional simplicity and sturdiness of design and construction of Saflex switch units. Ranging from 30 to 600 amperes, they are for use in systems up to 575 volts A. C. or 250 volts D. C.*

Ⓐ Cover can be locked in either the ON or OFF position by means of a padlock on the bracket. Ⓑ Arc suppressor block greatly increases the rupturing capacity. Ⓒ Shatter-proof insulating base is mounted in steel box for maximum mechanical protection. No molded parts are exposed when cover is closed. Ⓓ Solder-solderless lugs can be used either as solderless connectors or as solder lugs or both. Furnished on all except 30 ampere, 250 volt units. Ⓔ Positive pressure fuse clips have high conductivity and assure automatic contact pressure at the fuse terminals without auxiliary parts. Ⓕ Cam-action provided by handles near switch jaws where it is most needed. This cam-action supplies (with minimum manual effort) the considerable force necessary to provide high contact pressure.

• Saflex units are safe to operate. No live parts are exposed and all circuits may be opened safely under maximum load. The double-break switch jaws are visible for inspection when the unit door is open. The switch blade assembly is the only part carried on the permanently anchored door. All poles are broken simultaneously with no possibility of causing single phasing. Rotary switch blades are provided on all units except 600 ampere size. The cabinet doors are equipped with Yale cylinder locks which prevent unauthorized access to the panel. The box has over-size wiring gutters. The interior, front and box are separate units. Thus, the box can be shipped alone and roughed-in during the early stages of construction, with the interior and front following at a later date.

***See our catalog in SWEET'S or write for Bulletin 2500. Address* Square D Company, 6060 Rivard St., Detroit 11, Michigan.**



SQUARE D COMPANY

DETROIT • MILWAUKEE • LOS ANGELES

cated and secondary manufactured products.

Well-informed and astute local observers are widely at variance with certain cost figures suggested in a recent carefully prepared article in *Fortune*. Coke costs per ton of pig iron were there stated at $10 for both Geneva and Fontana. So far coke has been the most difficult problem for both mills. Coal costs the Kaiser Co. $3.50 per ton at the mine in Utah. Rail transportation to Fontana is $4.50 per ton. With two tons of coal depending on coal quality per ton of coke, and 1½ tons of coke per ton of pig iron, the value of by-products must be prodical indeed to achieve the $10 figure.

To add to ultimate costs is a huge tonnage of breeze that is said to be accumulating at Fontana.

To add further to costs is the present necessity of shipping from Oklahoma 300 tons per day of low-volatile coal, which costs $4.50 at the mine and on which the freight is $8.60 per ton. Best local expert opinion seems to be that present coke costs are $5 per ton for Provo, $6 per ton for Geneva and from $14 to $16 per ton for Fontana. Availability and utilization of heavy coal tar residues from petroleum refining and production of petroleum coke in Nolles ovens is regarded here as the only final economic solution of the Fontana coke problem.

Everyone hereabout agrees that the Fontana mill has done a superlative war production job, in licking its original construction and present volume operating problems. If costs were not to be a primary factor in the future, and if postwar intercoastal freight rates, company-operated ships, low-cost-at-Pacific-seaboard-mills scrap, and a much lower Geneva production cost and probable greatly reduced freight rate from there to Pacific ports on finished steel products were not hanging over Fontana's future, it would indeed be a bright star in southern California's very, very promising future industrial crown.

Best present guess of the ultimate rail freight rate on finished steel products from Utah to the Coast is $5. On an all-rail shipment from Pittsburgh or Birmingham now, $5 is approximately the share that goes to the carrier that hauls that part of the journey from Utah to the Coast. Moreover, fabricators, processors and buyers of steel believe that they can grow, expand their sales territory and hold present war-developed pace with about this differential over Pittsburgh or Sparrows Point base, instead of the old $12 which they feel kept them small and weak and local. If steel can be made at Geneva for about the same cost as at Eastern basing point mills, it seems to the far West that about this freight rate will maintain the industry to provide the volume to operate Geneva postwar at sufficient volume to hold its costs competitive.

* * *

Harmon Products of Los Angeles has been established by Forrest G. Harmon, in association with R. Perry Kilsby and Gerald Graham, as a warehousing, processing and special finishing firm for specialty metal products. The company has leased the former Bergstrom warehouse on East Saluson, where 35,000 sq. ft. of covered space and 75,000 sq. ft. in outside storage yard are available. Facilities will be installed to cut, edge, polish and finish to exact specifications specialty metal products that are not shipped by mills with refinement required by industrial buyers. Mr. Harmon was for many years a chief sales executive with the Columbia Steel Co. and more recently was organizer and general manager of Pacific Tube Co. His associates are partners in the mill agents firm of Kilsby & Graham and were respectively formerly with B & W Tube Co. and the National Supply Co. All are recognized and respected leaders in far Western industry.

* * *

Norris Stamping Co. has received WPB authorization to increase its plant facilities by 50 per cent with a $246,230 brick and reinforced concrete building, to amplify its artillery shell production. The company recently acquired a 6000 ton deep draw press, now in the open, and the new building will be erected around this principal equipment. Machine tools valued at $275,000 will be installed. Before the war a comparatively minor supplier of commercial stampings, the company is now engaged over 99 per cent on Army and Navy munitions contracts and was the national leader in perfecting the successful drawing of steel artillery shells.

* * *

Judson Pacific-Murphy Corp. has been formed with headquarters at San Francisco, to operate jointly and with combined management the former steel fabrication, crane building and steel erecting business of the Judson Pacific Co. and the reinforcing steel fabrication, erection and distribution activities of the former J. Philip Murphy Corp.

Paul F. Gillespie, for the past 25 or 30 years with Judson Pacific is president of the new syndicate and J. Philip Murphy is vice-president and general manager. Carlos J. Maas is vice-president. A. E. Wilkens, former vice-president and general manager of the Judson Pacific Co., has retired from active management. The financial support of the Bothin interests will continue in the newly formed corporation.

* * *

Guy F. Atkinson was low bidder for $2,586,450 to the Federal Bureau of Reclamation at Denver on a major project at Boulder Dam, including construction of a tunnel and channel improvement, to be completed within 750 days after notice of award.

MINE DETONATOR: *This spider-like attachment on the prow of a U. S. Marine tank is the Seabees' answer to enemy-sown land mines. It consists of a number of chain-tipped flails mounted on tubular hubs, which revolve to whirl the flails about creating a magnetic field to set off magnetic mines.*

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Among the features indicated below are many of the reasons for the high overall mechanical efficiency and the high volumetric efficiency of Vickers Variable Delivery Piston Type Pumps. Also, the inertia forces of the rotating parts are minimized . . . the cylinders are arranged axially permitting more compact design.

Write for new Bulletin 43-11 which includes description of construction, operation and types of controls, installation drawings, performance characteristics, installation and operating instructions of Vickers Variable Delivery Piston Type Pumps.

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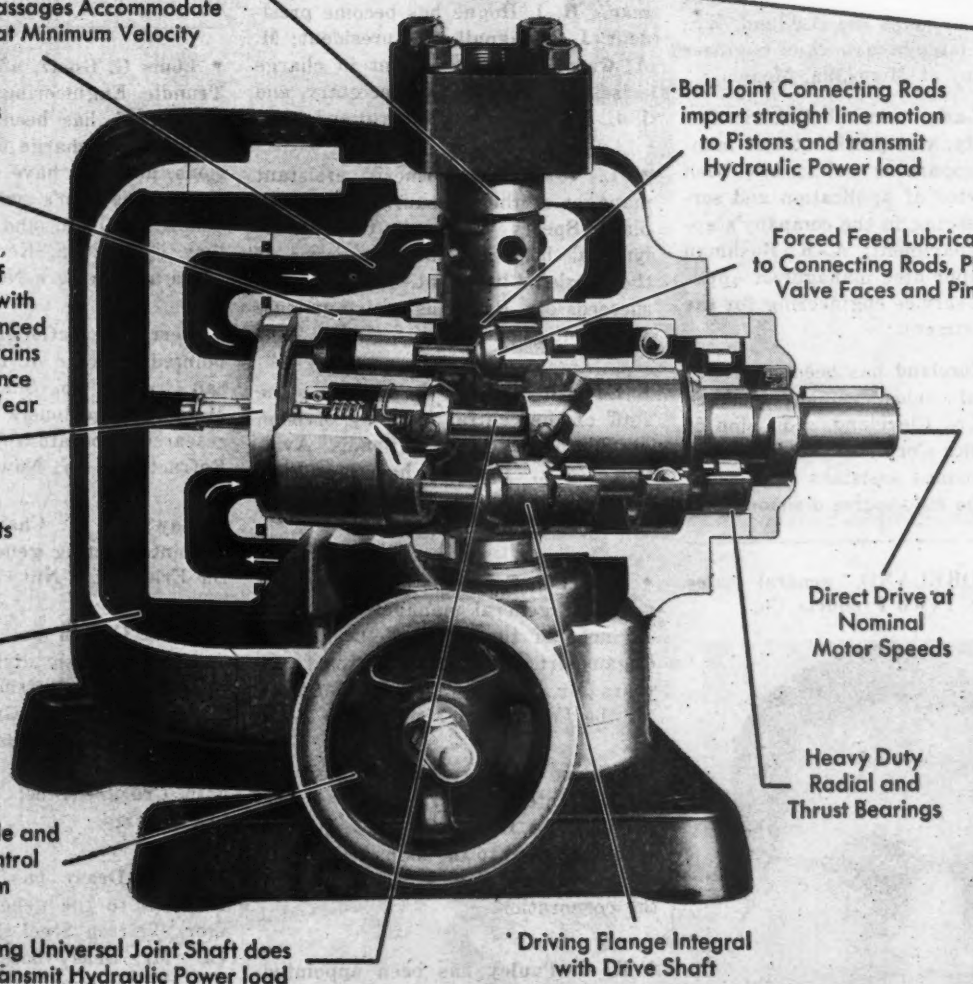

There Are More Than 5,000 Standardized VICKERS Units For Every Hydraulic Power and Control Function

PERSONALS

• **W. O. Lippman** has been appointed assistant to the president in charge of the Headquarters Manufacturing Department, Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa. Mr. Lippman, whose headquarters will be in Pittsburgh, succeeds **Ellis L. Spray. S. C. Hoey** has been appointed assistant director of the Headquarters Manufacturing Department.

• **L. F. Campbell,** formerly with United Aircraft Corp., has joined Foote Bros. Gear & Machine Corp., Chicago, as vice-president; **E. A. Johnson** and **R. B. Moir** have been made assistant vice-presidents, and **I. C. McVicar** and **L. J. Malina** were named, respectively, assistant secretary and assistant treasurer.

• **Roy P. Tooke** has been appointed assistant chief engineer, General Engineering Division, American Rolling Mill Co., Middletown, Ohio. Mr. Tooke joined the organization in 1924 as a draftsman at the Ashland, Ky., plant, and later became chief engineer of the plant at Monclana, Mexico.

• **C. H. Lang,** General Electric Co., Schenectady, vice-president and manager of apparatus sales, has been made director of application and service engineering in the company's apparatus department; **A. K. Bushman** has been appointed manager of application and service engineering for the same department.

• **E. S. Moreland** has been promoted to general sales manager, Pesco Products Co., Cleveland, a division of Borg-Warner Corp., and **A. E. Wilson** has been named assistant sales manager for the automotive division.

E. S. MORELAND, general sales manager, Pesco Products Co.

• **Edward C. Fales** has been elected vice-president of The American Welding & Mfg. Co., Warren, Ohio.

• **Lewis B. Williams** has been elected a director of Youngstown Sheet & Tube Co., Youngstown, Ohio, succeeding the late Fred Tod. **George E. Benson,** for the past 12 years treasurer of the company, has been elected vice-president in charge of finances to succeed the late Walter E. Meub.

• **John C. Wasmer,** president and treasurer of Wasmer Bolt & Screw Corp., Cleveland, has sold his interest in the company to officers and associates, and will continue as treasurer with C. L. Wasmer remaining chairman. **H. J. Hogue** has become president, **J. S. Rignall,** vice-president; **M. A. Gardner,** vice-president in charge of sales; **G. L. Howard,** secretary, and **J. L. Auer,** general superintendent.

• **L. V. Bedell,** formerly assistant manager of the Nassau, Long Island, plant, Sperry Gyroscope Co., Brooklyn, has been appointed manager of the Garden City plant. **G. J. Parker** succeeds Mr. Bedell as assistant Nassau plant manager.

• **Edward M. Cox,** formerly on the staff of the central planning division at South Bend, Ind., Bendix Aviation Corp., Detroit, has been appointed production manager of the Illinois division.

• **Rupert P. Esser** has been appointed assistant general manager and chief engineer of the Gerotor May Corp., Logansport, Ind. For the past six years Mr. Esser was chief engineer for the Logansport Machine Co.

• **Willard Walker,** vice-president of Mack - International Motor Truck Corp., Long Island City, N. Y., has been appointed to the managerial post of the Greater New York Division of the corporation.

• **R. G. Pauley** has been appointed district manager in Pittsburgh of the Mechanical Goods Division, The Goodyear Tire & Rubber Co., Akron, Ohio.

• **Donald O. Notman** has been appointed director of the newly-formed Technical Division of E. I. du Pont de Nemours & Co., Wilmington.

LOUIS G. GOETZ, vice-president in charge of central operations, The Trundle Engineering Co.

• **Louis G. Goetz,** affiliated with The Trundle Engineering Co., Cleveland, since 1936, has been appointed vice-president in charge of central operations, and will have over-all supervision of the firm's service activities in Ohio, Michigan, and adjacent territory in Indiana, Kentucky, Pennsylvania and western New York State.

• **Perry C. McCollom** has been appointed director of research, American Crucible Co., Shelton, Conn. Mr. McCollom previously was head of the research laboratory of New Castle Refractories Co., New Castle, Pa.

• **Lawrence C. Chambers** has been appointed acting general manager of the Erie Bolt & Nut Co., Erie, Pa.

• **E. C. Grimm** has joined the iron and steel scrap division of M. B. Speer & Co., Pittsburgh. Prior to joining Speer, Mr. Grimm was associated with H. F. Stocker & Co. for about a year, and previously was with Crucible Steel Co. of America for 23 years.

• **J. K. Deasy** has been appointed assistant to the general traffic manager, Weirton Steel Co., Weirton, W. Va. Mr. Deasy has been connected with the company since 1938 in metallurgical and sales capacities, and for the past year has been a member of the staff of the firm's Chicago office.

• **A. S. Rairden** has been named sales manager of the Wire Rope Division, Wickwire Spencer Steel Co., New York.

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Fairbanks-Morse postwar products will serve you with the *dependability* the world has come to associate with our name. Designing and manufacturing skills will not have to be re-learned in our plants as we turn to civilian production, because as a part of our war job, we've continued to build and improve our peacetime Diesel engines, generators, motors, pumps, and scales.

R. H. Morse Jr.

General Sales Manager

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Fairbanks-Morse Scales are far more than lastingly accurate weighing instruments. They are production tools, too. They speed manufacturing and distribution by counting parts and products, by weighing while materials are moving, by printing weight records, by weighing and disbursing preset amounts automatically, by guarding ingredient proportion secrets, and by performing many other often amazing services.

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Scales • Generators • Motors • Pumps
Magnetos • Stokers • Railroad Motor
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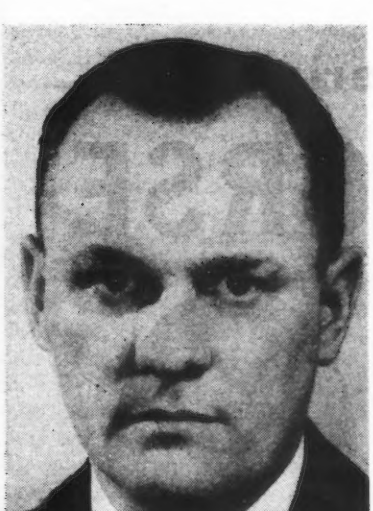


GEORGE C. FLOYD, plant manager, Allegheny Ludlum Steel Corp.

• **George C. Floyd,** assistant plant manager since 1936 at the West Leechburg, Pa., plant of Allegheny Ludlum Steel Corp., Pittsburgh, has been appointed plant manager; **Harry L. Myers,** for many years manager of the West Leechburg plant, has been appointed assistant personnel director, succeeding **Walter C. Titus,** retired.

• **Charles H. Lewis** has been elected president; **E. Milton Barber,** executive vice-president; **Herman A. Mentall,** vice-president in charge of operations, and **William F. Rummell,** vice-president in charge of sales, The Thomas Steel Co., Warren, Ohio.

• **Marvin A. Joy,** formerly sales manager of the Midwestern Division at Cleveland, has been appointed assistant general sales manager, Mill Division, Chase Brass & Copper Co., Waterbury, Conn. **Walter E. Evans,** previously sales promotion manager at Waterbury, succeeds Mr. Joy as manager of the Midwestern Division. **John S. Coe** has been appointed to the newly-created position of assistant to the vice-president in charge of Cleveland operations.

• **Ivan F. Harlow** has been appointed production manager for the inorganic division of Dow Chemical Co., Midland, Mich., succeeding **Dr. E. O. Barstow.**

• **I. C. Clingan,** formerly of the Rustless Iron & Steel Corp., has joined the Eastern Stainless Steel Corp., Baltimore, as chief chemist.

• **George S. Ryan** has been appointed assistant to vice-president of the Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa. **C. B. Dick** succeeds Mr. Ryan as manager of the Feeder Division, and **E. R. Perry** has been made manager of the Micarta Division. Mr. Ryan joined Westinghouse in 1922, became superintendent of the Motor Division in 1933 and manager of the Feeder Division in 1938.

• **J. W. Jaspersen,** former supervisor of customer relations for the Toledo Steel Products Co., Toledo, Ohio, has been appointed district manager for the firm in a newly-created territory comprising Wisconsin and part of upper Michigan.

• **Frederick Kalmbach, Jr.,** has been elected president of the General Machine Co., Inc., Emmaus, Pa., to succeed his father, **Fred Kalmbach,** who remains as chairman of the board of directors. **M. Lindroth** has been elected vice-president.

• **Lawrence Jennings** has been named assistant to E. O. Shreve, vice-president of General Electric Co., Schenectady, in charge of customer relations.

• **David F. Devine** has been appointed comptroller of the Bell Aircraft Corp., Buffalo. Mr. Devine succeeds **John Berry, Jr.,** resigned.

• **C. W. Cordry** has been named manager of the new Indianapolis office and **D. M. Tatem,** manager of the recently established office at Birmingham, The B. F. Goodrich Co., Akron, Ohio.

• **W. E. Olds** has joined the American Car & Foundry Co., New York, as sales agent, with headquarters at Chicago.

• **R. L. Heath,** formerly chief metallurgist, Allison Division, General Motors Corp., has joined the Climax Molybdenum Co., New York, as metallurgical engineer.

• **Ralph J. Teeple** has been appointed general district sales manager of the New York District, American Chain & Cable Company, Inc., Detroit, Mich. Mr. Teeple has been with the Page Steel and Wire Division of the company for 23 years. Prior to that time he had charge of the Chain Link Fence Sales Department.

ARTHUR H. HJORTSBERG, assistant general superintendent, Gary works, Carnegie-Illinois Steel Corp.

• **Arthur H. Hjortsberg** has been appointed assistant general superintendent Gary works, Carnegie-Illinois Steel Corp., Pittsburgh, succeeding **Dr. Erle G. Hill,** resigned. Mr. Hjortsberg became associated with Gary works in 1925 and since February, 1943, has been division superintendent of the central rolling mill. **Edwin H. Gott** has been appointed assistant to the general superintendent, in charge of service departments. **John J. Golden,** since 1940 superintendent of the steel production division, has been named division superintendent of the combined open hearths and central mills.

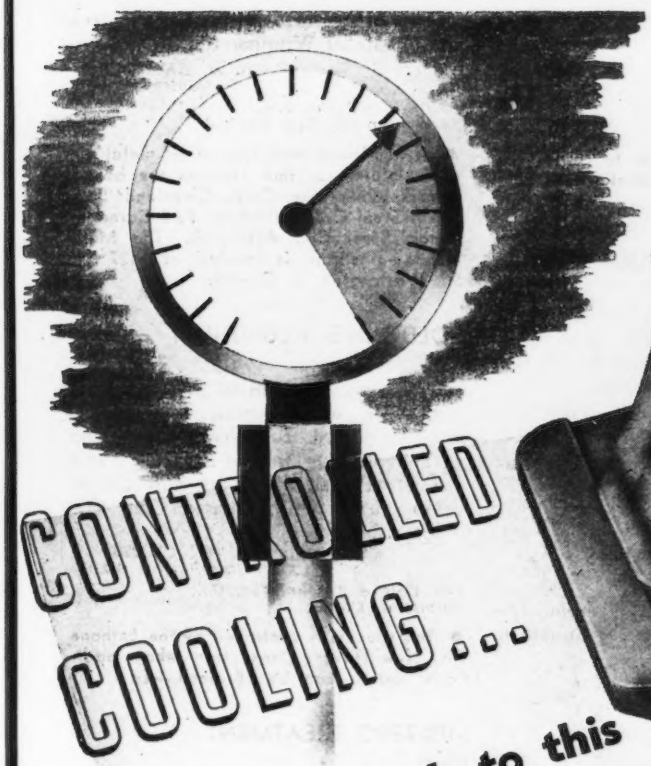
• **Louis McGuire** has been appointed sales engineer to cover the states of Tennessee, Mississippi and Alabama for the Copperweld Steel Co., Glassport, Pa. Mr. McGuire will be located in Birmingham, Ala.

OBITUARY...

• **Oscar A. Swanson,** 66, president of the Swanson Tool & Machine Corp., Erie, Pa., died January 26.

• **Eshelby F. Lukens,** 54, president of The Lunkenheimer Co., Cincinnati, died suddenly January 25.

• **Michael V. Bonomo,** former national president of the Institute of Scrap Iron and Steel, and treasurer of Schiavone-Bonomo Corp., Jersey City, N. J., died February 6 at the age of 51.



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When molten aluminum solidifies inside the metal walls of a permanent mold, the metal surfaces hasten the cooling process. This rapid cooling results in a finer grained casting, with greater tensile strength. Thus, in many cases it is possible to safely reduce the thickness of sections, with a saving in metal, weight and money.

Increased tensile strength is but one of the important advantages of the permanent mold process. As used at Permite, this process produces aluminum castings of precise dimensions, uniformly maintained. Permite Aluminum Castings, produced in permanent molds, can be held to a dimensional tolerance of ± .010", compared to the standard of ± .030" for sand castings.

Low production costs and advanced refinements are essential for products planned for today's markets. One of our technical representatives will be glad to show how Permite Permanent Mold Aluminum Castings may help you attain these essentials in your products. Recommendations and estimates submitted without obligation.

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PERMITE ALUMINUM ALLOY CASTINGS

SUPERCHARGER BUCKETS

Sir:

Can you send us the article on Precision Casting of Turbosupercharger Buckets, from the Feb. 10, 1944, issue. We have given this issue out for the paper drive and therefore are obliged to ask you for this article.

RUDOLPH O'LARTE,
Plant Manager.

Jacques Kreisler Mfg. Corp.,
North Bergen, N. J.

● Sorry, but our supply is exhausted. We suggest you consult a local library.—Ed.

STEEL CONSUMPTION

Sir:

Shipments of steel products classified by consuming industries are listed in the Dec. 14 issue on page 114. Will you please inform me for how many years these statistics are available, and the best source?

EMILE Z. BAKER

Tait, Weller & Baker,
8 West 40th St.,
New York

● These statistics are released by the American Iron and Steel Institute, 350 Fifth Avenue, New York, quarterly since 1943, and annually since 1940. Earlier statistics may be obtained from THE IRON AGE issues of Jan. 4, 1945, page 59, and Jan. 2, 1941, page 94.—Ed.

PUBLIC RELATIONS

Sir:

The subject of my thesis at the Graduate School of Banking at Rutgers University is press relations. It is my opinion that banks have suffered from poor press relations and I am writing you and other publishers to ask how they might be improved. What can banks do to help disseminate accurate financial and economic information to the public? I have been wondering whether banks might be too conservative to publish opinions on these matters, but am told that the press is unwilling to accept articles on financial practices from banks, believing that they may be seeking free advertising.

HAROLD M. J. LEWIS,
Assistant Vice-President

Manufacturers National Bank of Troy,
Troy, N. Y.

● Press or public relations is apparently going to be one of the great absorbers of manpower after the war, since it seems that everybody is going to be interpreted to the public.

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212 Fifth Ave., New York 10

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14 Strachan Ave., Toronto 1, Canada

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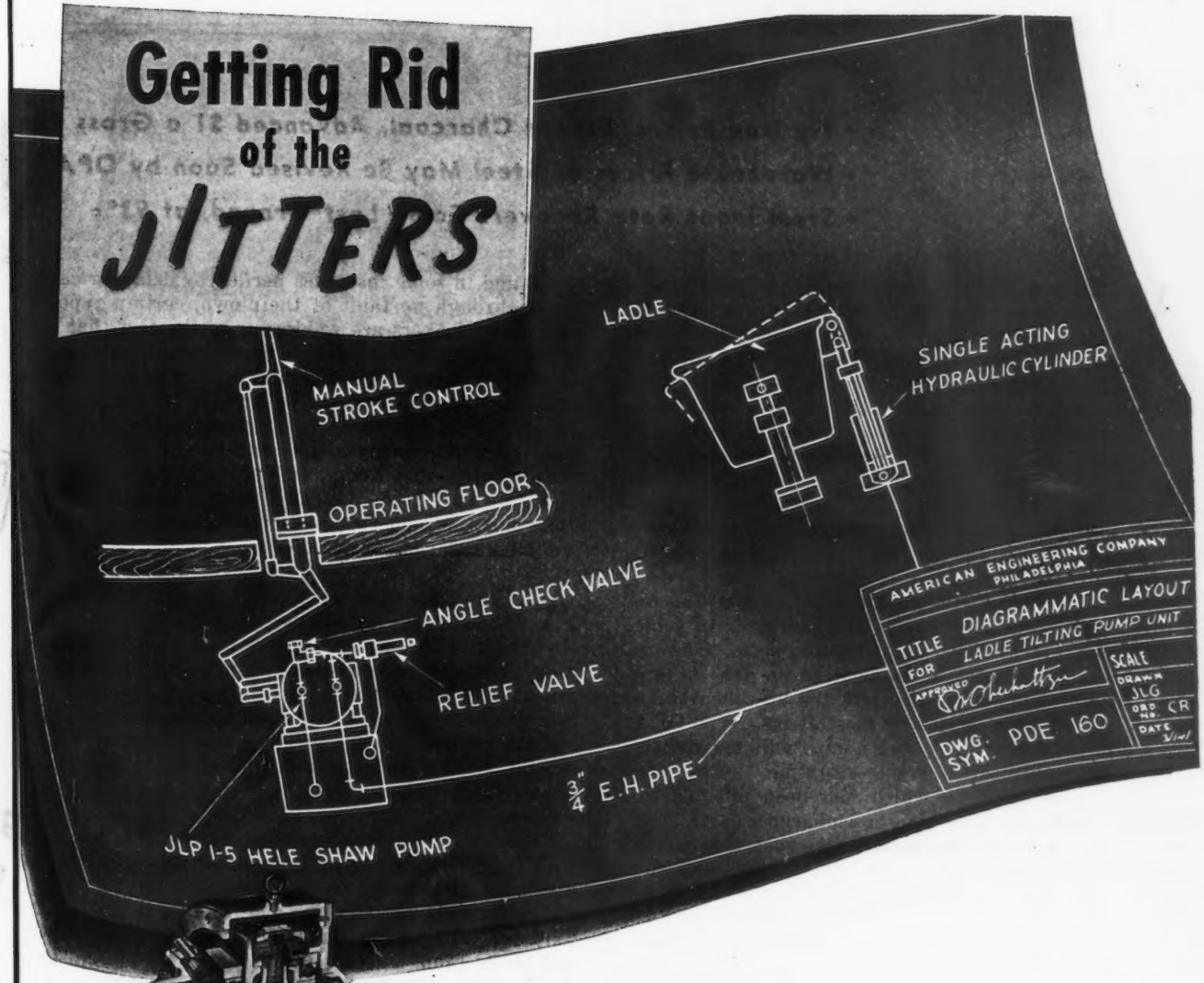
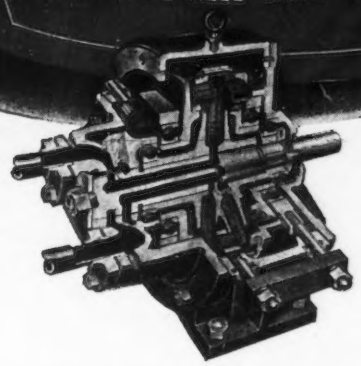
Getting Rid of the JITTERS





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OTHER Æ PRODUCTS:
TAYLOR & Æ PERFECT SPREAD STOKERS;
MARINE DECK AUXILIARIES, LO-HED HOISTS,
DIAMOND FACE GRINDERS

AMERICAN ENGINEERING COMPANY
2430 ARAMINGO AVENUE, PHILADELPHIA 25, PA.

SUPERCHARGER BUCKETS

Sir:

Can you send us the article on Precision Casting of Turbosupercharger Buckets, from the Feb. 10, 1944, issue. We have given this issue out for the paper drive and therefore are obliged to ask you for this article.

RUDOLPH O'LARTE,
Plant Manager.

Jacques Kreisler Mfg. Corp.,
North Bergen, N. J.

● Sorry, but our supply is exhausted. We suggest you consult a local library.—Ed.

STEEL CONSUMPTION

Sir:

Shipments of steel products classified by consuming industries are listed in the Dec. 14 issue on page 114. Will you please inform me for how many years these statistics are available, and the best source?

EMILE Z. BAKER

Tait, Weller & Baker,
8 West 40th St.,
New York

● These statistics are released by the American Iron and Steel Institute, 350 Fifth Avenue, New York, quarterly since 1943, and annually since 1940. Earlier statistics may be obtained from THE IRON AGE issues of Jan. 4, 1945, page 59, and Jan. 2, 1941, page 94.—Ed.

PUBLIC RELATIONS

Sir:

The subject of my thesis at the Graduate School of Banking at Rutgers University is press relations. It is my opinion that banks have suffered from poor press relations and I am writing you and other publishers to ask how they might be improved. What can banks do to help disseminate accurate financial and economic information to the public? I have been wondering whether banks might be too conservative to publish opinions on these matters, but am told that the press is unwilling to accept articles on financial practices from banks, believing that they may be seeking free advertising.

HAROLD M. J. LEWIS,
Assistant Vice-President

Manufacturers National Bank of Troy,
Troy, N. Y.

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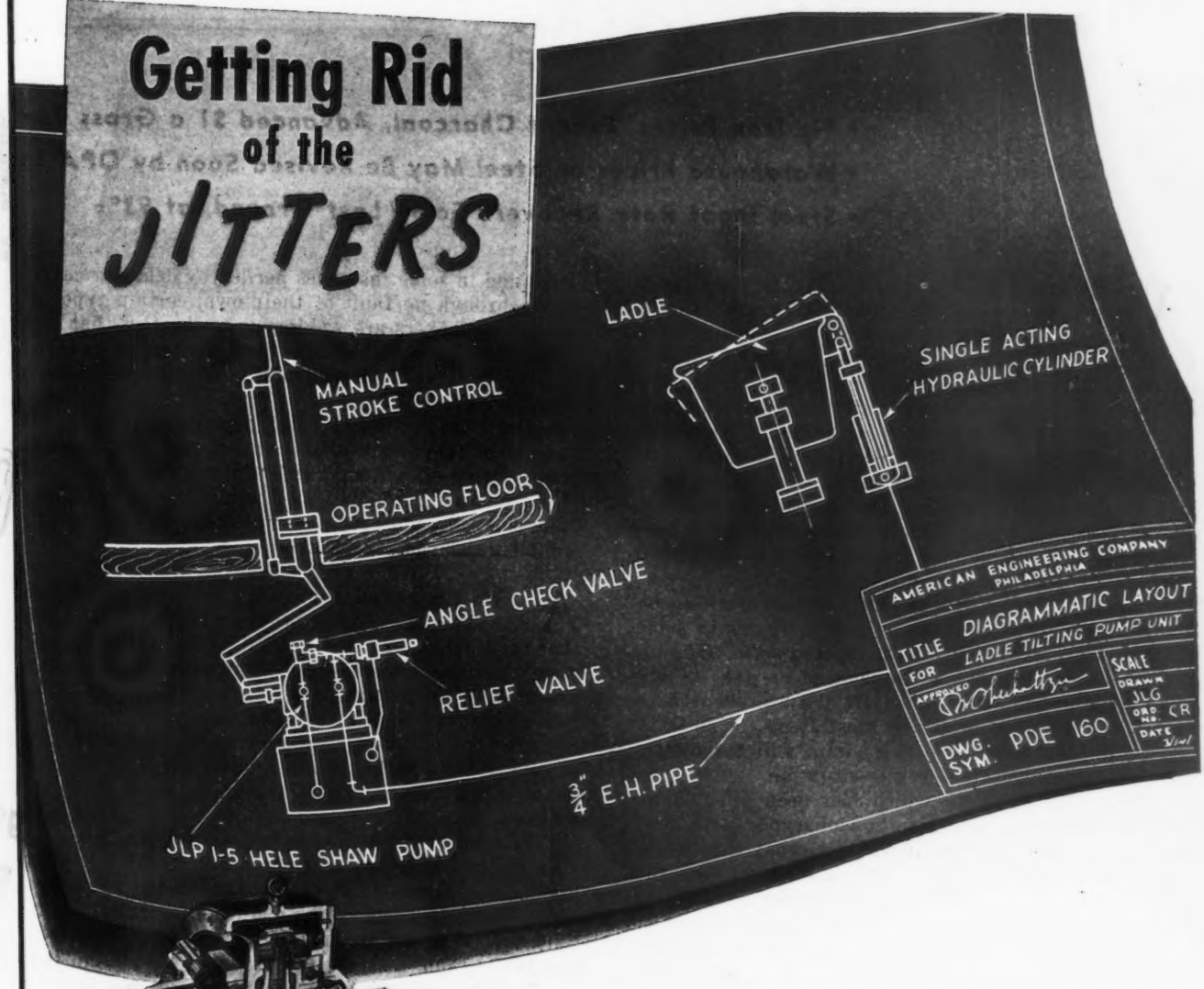

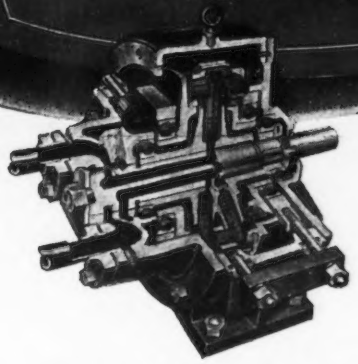

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Fluid Power

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AMERICAN ENGINEERING COMPANY
2430 ARAMINGO AVENUE, PHILADELPHIA 25, PA.

This Industrial Week . .

- ***Pig Iron Prices, Except Charcoal, Advanced $1 a Gross Ton***
- ***Warehouse Prices on Steel May Be Revised Soon by OPA***
- ***Steel Ingot Rate Recovers Some Lost Ground, at 93%***

AT long last pig iron producers this week were permitted to raise the price of all grades, except charcoal, $1 a ton on the base price. This move by OPA which became effective Feb. 14 will undoubtedly give some measure of relief to pig iron producers especially the smaller furnaces which have had rough going because of accumulated raw material costs. While the OPA decision will not satisfy many in the trade, nevertheless it was hailed as a step in the right direction. The increase is the first overall hike in pig iron ceiling prices since price control began and when the pig iron Schedule E was issued on June 24, 1941.

According to reports the OPA is now working on a revision of warehouse prices and increases in some categories are expected to be permitted soon. The interim steel price increases announced on Jan. 11 applied to mill quotations and left the warehouses to absorb these higher prices on most items. The OPA after studying warehouse price data will apparently attempt to compensate for this situation.

Most steel districts which had been affected by weather conditions and freight embargoes have seen their steel ingot rate expanded somewhat this week, with the result that steel ingot operations for the country rose sharply this week to 93 per cent of capacity compared to 87 per cent last week. Greatest expansion in raw steel output occurred at Buffalo where the rate rose 48.5 points to 104.5. Other increases occurred at Pittsburgh, up seven points to 87 per cent; Youngstown, up three and a half points to 83.5 per cent; Wheeling, up two points to 90 per cent; Philadelphia, up half a point to 95.5 per cent; Cleveland, up five points to 90 per cent; Detroit, up half a point to 97.5 per cent and the Eastern District, up two and a half to 95 per cent. Chicago at 100; Birmingham at 97; Cincinnati at 101; the Western District at 90.5, and St. Louis at 94.5 per cent continued unchanged.

Even though raw steel output has regained some lost ground, this week, Pittsburgh reports that a car shortage there will likely present a difficult problem in shipping finished steel out of the mills. For the first time, there, operations in the finishing end have been specifically affected by this car shortage. Despite the present seriousness of the railroad car supply, steel operators display a more optimistic tone.

MORE favorable war news has caused no dwindling in the flood of new orders. One major steel producer indicates that orders during the past two weeks have been doubled that of shipments. Current emphasis in order volume is on sheets, rails, semi-finished steel and tin plate.

The increased use of directives in order to obtain material promptly, appears to be the outstanding pattern in the order situation. Hardship among customers is likely to result because of this condition. Caught flat-footed by the rapid extension of delivery dates and in some instances periled by delaying carryovers through no fault of their own, certain types of war goods makers are waking up to the fact that only order directives will enable them to secure material in time to meet their contracts. This is particularly true for sheets.

Hit hard by the terrific demand for war steel have been the concrete bar makers and the building trades using this item. Deliveries previously scheduled for April and May are being pushed back into June and July and proposed building schedules will be similarly delayed.

AT Cleveland steel companies report the biggest backlog since the war began. Opinion there holds that the number of small orders is impressive because many consumers are hesitant about piling up too much inventory. Some steel users are not ordering the full amount of steel needed on any given program, but are content to take delivery as allotted. This, it is said, results in last minute hurry-up calls for material which can only be satisfied by more WPB directives.

Locomotive orders were in the limelight this week with the following having been placed: 500 for France, divided as follows: 250 to American Locomotive and 250 to Baldwin Locomotive; 690 for Russia, divided as follows: 250 to American Locomotive, 260 to Baldwin and 180 to Lima Locomotive. Reports are current that the French order has been increased by 200 locomotives making a total of 700. It is also said that the Army will purchase a substantial number of locomotives. The Chesapeake & Ohio has ordered 10 locomotives from Lima. As a result of these orders, boiler tube deliveries are tighter than at any time since war began. This is because mechanical tubing for boiler tubes, ammunition and other war items come off the same mills in many instances.

The War Production Board has authorized construction for 50 50-ton flat cars by American Car & Foundry Co. for the Illinois Terminal Railroad. The War Department has ordered 400 40-ton tank cars for Russia from General American Transportation Corp. and 265 of the same kind of cars for Russia from American Car & Foundry. The War Department has also placed orders for 500 40-ton dump cars with Magor Car Corp.

Direction No. 6 to the farm machinery Production Limitation Order L-257, allowing manufacturers which are not running at full capacity and have necessary labor available to apply for authorization to produce more than their approved quotas is not expected to be of much help in badly lagging overall farm equipment production. The bulk of the nation's manufacturers are located in the midwest, currently ranking as the country's tightest manpower region. Most manufacturers are up to their ears in war contracts and are transferring skilled workers from farm equipment to war production.

• **WPB RECALLS STEEL EXPERTS**—The Steel Division of the War Production Board at its peak activity totaled about 850 people. When the cutback was made on the personnel, this figure was reduced to about 250. The increase in war steel activity required the services of some men who had returned to industry. While the recalling of certain steel men was put off as long as possible, the WPB recently was forced to bring back about eight men. Among them were Walter H. Wiewel, National Tube Co., Pittsburgh, an expert on pipe and tubular goods; Arthur A. Wagner, Jones & Laughlin Steel Corp., Pittsburgh, who formerly headed up the hot rolled steel product and semi-finished departments of the steel division; and Thomas Ford, Electro Metallurgical Co.

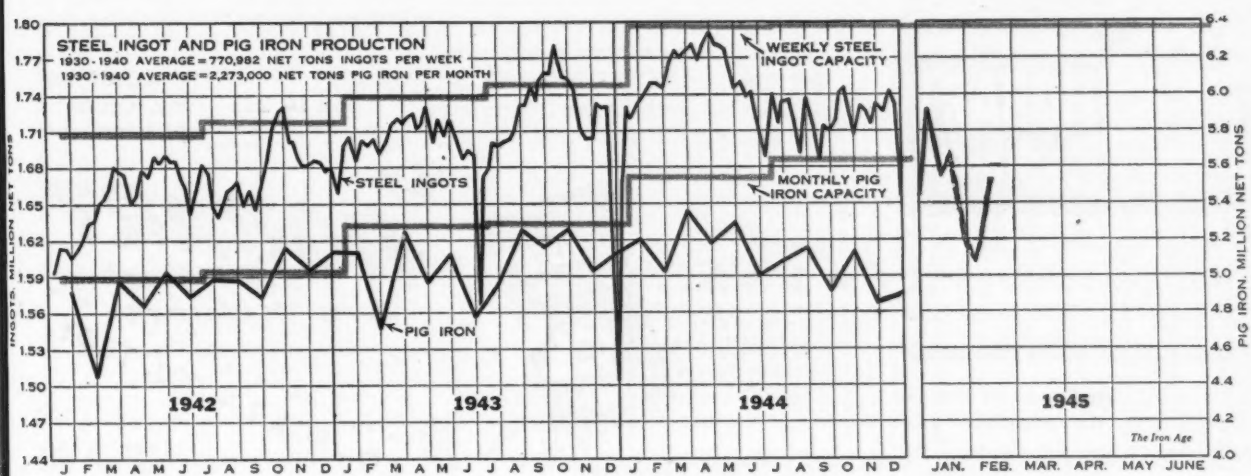
• **COAL WAGE JITTERS**—The old bugaboo of a possible coal mine stoppage is raising its head high these days. Deep concern is being felt in all quarters. The shortage in coal stockpiles as well as the difficulty in obtaining manpower are already causing severe headaches to steel and other industrial plants. A coal strike after March 31, when the operator-miner wage agreement for the bituminous coal industry expires would be the final straw "that broke the camel's back." Worker efficiency in many coal mines is at low ebb and indicative of the increase in the age of miners is the Bituminous Institute's figures which show the average age of coal miners was raised from 32 to 45 during the war.

• **LIGNITE TO HELP FUEL SHORTAGES**—As part of a program to alleviate wartime fuel shortages in the Pacific Northwest, the Bureau of Mines has conducted tests which show that a lignite deposit in Lewis County, Wash., can be developed to furnish fuel for an industrial plant, providing such facilities are located relatively near the coal bed, Bureau spokesmen reported. Although the area has not been explored fully, Bureau officials said that "it seems probable that the deposit, so far as revealed by incomplete prospecting, contains at least several million tons of recoverable coal." Limited exploration by private companies indicates that the lignite averages 40 ft. in thickness and the overburden about 43 ft.

• **STEEL PAYROLL RECORD**—Total payrolls of steel companies in 1944 reached a new record of $1,745,019,700, almost $96,000,000 more than the previous peak of $1,649,227,000 paid out in 1943, according to the American Iron & Steel Institute. The total for 1944 includes the payment of part of the retroactive wage increases called for by the decision late last year in the steel wage case. Hourly and weekly earnings of wage earners also set a new record last year, averaging 121.9c. per hr. and $56.93 per week over the entire year. In 1943, hourly earnings averaged 113.5c. and weekly earnings $48.81. Average employment in steel plants declined in 1944. Over the whole year an average of 571,200 employees was at work in the industry as against total employment of 626,000 in 1943. The number of hours worked per week by wage earners averaged 46.7 during 1944, compared with 43.0 hr. per week in 1943. In December of last year, steel payrolls totaled $139,894,900 as against $143,136,800 in November and $140,202,700 in December, 1943. Employment averaged 563,900 in December, 1944, compared with 564,200 in November and 604,700 in December, 1943. Wage earners received an average of 119.7c. per hr. in December of last year, 120.2c. per hr. in November and 116.1c. per hr. in December, 1943. Hours worked weekly in the closing months of 1944 averaged 45.0, compared with 47.7 in November and 43.2 in December, 1943.

• **WAREHOUSE STOCKS CRITICAL**—Cutting of warehouse stocks continues to provide temporary relief to consumers unable to secure required mill deliveries, but inventories are rapidly approaching exhaustion. In view of the tangled mill situation, there appears little likelihood that they can be replaced. The warehouse sheet supply already is critical and stocks of galvanized sheets virtually are non-existent. Most warehouses are two to three weeks behind on shearing.

• **SOME SUNDAY COAL MINING POSTPONED**—Conditions on the Monongahela river and its tributaries near Pittsburgh, Pa., necessitate postponing coal mining operations which were scheduled Feb. 11 at 21 mines that move their output by river barge, Deputy Solid Fuels Administrator C. J. Potter announced recently. He informed steel companies in the Pittsburgh-Youngstown-Wheeling areas whose captive mines were to have been operated that the extra operation is impossible because of the uncertain supply of barges. Free ice on the rivers near Pittsburgh, he said, already is forcing curtailment of water movement of coal and has caused closing of some mines. Full "tow" cannot be hauled and coal barges are seriously delayed in making round trips. Ice in several pools is too thick to permit navigation.



Steel Ingot Production by Districts and Per Cent of Capacity

Week of	Pittsburgh	Chicago	Youngstown	Philadelphia	Cleveland	Buffalo	Wheeling	South	Detroit	West	Ohio River	St. Louis	East	Aggregate
February 6	80.0	100.0	80.0	95.0	85.0	55.5	88.0	97.0	97.0	90.5	101.5	94.5	92.5	87.0
February 13	87.0	100.0	83.5	95.5	90.0	104.5	90.0	97.0	97.5	90.5	101.5	94.5	95.0	93.0

You get 1000 combinations of welding heat...

...plus Remote Control in a HOBART

The right electrode for a specific application, when applied with PROPER CONTROL OF HEAT, will produce the desired properties in the weld. Guess work doesn't count, for example, in the welding of Stainless Steel as illustrated above, spoilage cannot be tolerated because it is one of the more costly metals and rejects mean a considerable loss in both time and material.

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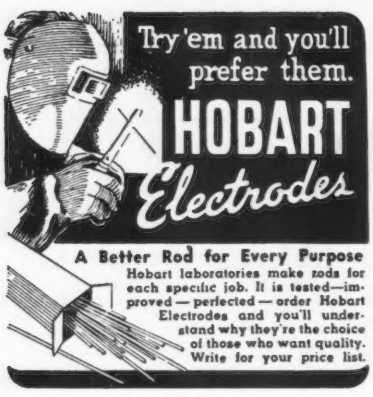
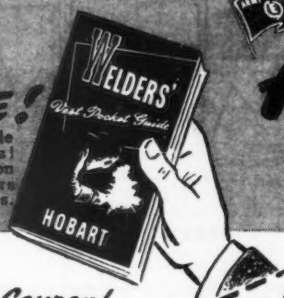
Box IA 233, Troy, Ohio
"One of the World's Largest Builders of Arc Welders"



FREE! Vest Pocket Guide for Weldors! Handy information that all weldors will use. Tables, charts, etc.



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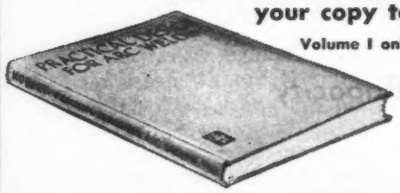

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- ☐ "Practical Design for Arc Welding"

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BUY WAR BONDS!

Darkhorse Entries Still Running In Postwar Western Steel Sweepstakes

o o o

By CHARLES T. POST

o o o

Chicago

• • • Public offers by United States Steel Corp. and the Henry J. Kaiser interests to take over each other's publicly-financed far Western steel mills recalls that other less loquacious major steel interests may still nurse aborted desires to increase their stature on the West Coast.

In the original Office of Production Management layout of steel capacity expansion presented Sept. 24, 1941, Bethlehem Steel had proposed a new Los Angeles plant to include two blast furnaces, coke ovens, about 700,000 tons of open hearth capacity, an alloy steel plant, and rolling mills including a 46 in. roughing mill, a combination 36 in.-28 in. billet, rail and structural mill, a 14 in.-16 in. bar and structural mill, and a 12 in. bar mill with auxiliary and service departments. Products were to include structurals, sheet piling, rails, splice bars, tie plates, shell steel, open hearth, carbon and alloy bars and electric alloy bars. At that time, Columbia Steel, U. S. Steel West Coast subsidiary, anticipated blast furnace and coke oven capacity in Utah slightly smaller than that later constructed at Geneva, but planned to construct its steel works and rolling mills adjacent to its present plant at Pittsburg, Calif. Rolling mill plans at Pittsburg included a sheet mill.

For Late News on the St. Lake City Steel Meeting This Week see p. 104.

Further light is cast on Kaiser's present Utah ambitions by a description in the Sept. 24 report of a proposal by him to build blast furnaces in Utah, a steel plant in Los Angeles, and electric furnaces using Bonneville power along the Columbia River in Oregon.

By Nov. 11, 1941, when OPM again reported on steel expansion plans, the War Department had put the kibosh on Bethlehem's Los Angeles plan, asking that "this particular area be reserved for other defense needs." The Steel Corporation's Geneva plant had commenced to take shape on paper with a modification of the original proposal which would move the open hearth plant, of 784,000 tons capacity, to Utah. The plate mill, however, still was to be built at Pittsburg, Calif. Removed from the Los Angeles area, Bethlehem's proposal embraced installation of 648,000 tons of open hearth and 60,000 tons of electric furnace capacity at its existing plant in South San Francisco. Both the steel making and rolling mill capacities were approximately the same as those which would have been installed in Los Angeles area, but the blast furnaces were noticeably absent. Quite possibly it was anticipated that Bethlehem would supplement local scrap at San Francisco with some pig iron shipped by an enlargement of Columbia's Utah blast furnace program.

The Kaiser proposal still was a dark horse.

By the beginning of 1942 Bethlehem eased or was eased out of the picture almost completely, and finally wound up by installing an additional open hearth at each of its three West Coast plants at Seattle, South San Francisco, and Los Angeles, and making relatively minor changes in its finishing facilities. The Kaiser project at Fontana, located about 80 miles east of Los Angeles, had become a full-blown affair.

Through the steel making stage, the Kaiser plant bears remarkable resemblance to that originally proposed by Bethlehem. Kaiser built one 1200 ton blast furnace. Bethlehem would have built two smaller blast furnaces, bearing in mind the weak coke available, but the total capacity would have been about the same. Bethlehem's proposed open hearth and electric steel making capacity was 708,000 tons. Kaiser now can turn out 720,000 tons of open hearth and electric steel. In the finishing departments the similarity diverges, however. About 300,000 tons of the Kaiser capacity. is plates. Bethlehem's proposal mentioned no plates. Bethlehem apparently would have replaced this plate capacity with rails and accessories, sheet piling, and increased bar capacity.

In this finishing capacity difference probably lies the key to Bethlehem's approach to the West Coast market. Competitors often have commented that a profitable operating rate underlies Bethlehem's pricing policies, rather than a theoretical base unit cost. On this theory, it would appear that Bethlehem at no time has considered jeopardizing its Sparrows Point operation, peace time source of most Bethlehem flat rolled steel shipped to the Coast via the Panama Canal. Thus flat rolled production on the Coast might not readily fit into Bethlehem's picture.

It is problematical what proportion of the present far Western three million ton annual consumption of

Pig Iron Upped $1 a Ton

Washington

• • • An increase of $1 a gross ton in basing point ceiling prices for pig iron of all kinds except charcoal pig iron was announced by OPA on Feb. 14, effective the same day. OPA said the increase is required by law to restore the industry's earnings to prewar levels and to maintain ceilings which are generally fair and equitable. Pig iron production costs, OPA continued, have risen $4.79 per gross ton since mid-1941. Despite some improvement in sales realization during that period, an adjustment of price is necessary, OPA said.

The new base ceiling price for No. 2 foundry pig iron, f. o. b. Bethlehem, Pa., is $26 per gross ton compared with $25 previously and $25 per gross ton, f. o. b. Chicago basing point compared with $24 previously. Increases of $1 a gross ton were made in all other basing point ceiling prices for No. 2 foundry, basic, Bessemer, malleable and low phosphorous pig iron.

This was the first overall increase in pig iron ceiling prices since price control began with the issuance of the pig iron schedule on June 24, 1941, formalizing a voluntary agreement of the industry with OPA that pig iron would not be sold above the prices in effect on June 24, 1941. The price of charcoal pig iron was increased from $28 to $34 per ton, Lake Superior furnaces, on July 1, 1943. At present only one charcoal furnace, located at Newberry, Mich., is in operation.

plates will remain after the war. If the severe drop usually predicted materializes, the Kaiser finishing facilities will have to be considerably revamped to utilize the full ingot capacity. Thus, if Bethlehem still is interested in acquiring in Southern California the type of mill it once proposed to construct, the Kaiser plant might well still be considered. However, at the time the original Bethlehem proposal was made steel observers on the Coast wondered whether there was any real eagerness by Bethlehem to build a big fully integrated plant or whether it was more a matter of "Well, if the government is determined that there shall be this capacity out there, we might as well build it and protect our major interest in the area." The economic feasibility of producing pig iron in California under peace time conditions has not yet been proven.

Because the obvious eventual destiny of Geneva, if it is to operate postwar anywhere near capacity, includes addition of a continuous strip mill, it is doubtful as to how much interest Bethlehem has in that direction, other than keeping its eye on its major West Coast competitor.

Although nothing appeared in print at the time, rumors wafted about the Coast in 1939 that Republic hoped to enter the production picture out there. The proposal involved, presumably, a small open hearth plant to feed a knocked down hand sheet mill transported from the East. Although the cost mentioned was extremely small as steel mills go, financial details reported constituted a major stumbling-block, and the project has not been heard from since. Possibly the economics of operating a hand sheet mill in competition with products of continuous mills shipped by water from the East had something to do with it. Tom Girdler later became involved in West Coast manufacturing problems on a bigger scale than the Republic project ever would have embraced through his association with Consolidated Vultee Aircraft.

Always a sleeper in the disposal of the West Coast plants, and no doubt in part responsible for the public announcement by the Steel Corporation of its aims, are the West Coast interests ogling a chance to acquire either Fontana or Geneva. Capital here constitutes the major problem and thus it is important what policy guides the government disposal of these plants. Disposition of Henry Wallace's nomination as Secretary of Commerce may provide the answer.

OPA Grants Bituminous Price Increase to Cover Two Sundays' Work

Washington

• • • OPA has announced that coal producers in the big southern Appalachian districts may temporarily increase their ceiling prices of bituminous coal from 5c to 15c a ton to help pay for extra costs of Sunday operation of their mines in February. In an effort to increase current supplies of high grade southern bituminous coal to meet a serious shortage, the Solid Fuels Administration has asked producers in this area, which serves steel and other industrial plants, to operate on two Sundays during February.

Those mines which comply with the request and operate two Sundays will be able to obtain increased prices for one month. Any mines that operate only on one of the specified Sundays can increase their prices for two weeks. Dealers will be permitted to pass on to their industrial customers the increases of from 5c to 15c a ton that producers are permitted to charge on all industrial sizes of coal.

The southern Appalachian producers affected are located in bituminous coal producing districts 7 and 8 and include also those producers in district 13 who are located in Tennessee. District 7 comprises the southern part of West Virginia and the northwestern section of Virginia. District 8 comprises eastern Kentucky, southwestern West Virginia, western Virginia, northern Tennessee and three counties in North Carolina.

Producers are permitted to increase their ceilings by 5c per ton on all coal sizes, both domestic and industrial, produced in district 8. On coal produced in district 7 and by Tennessee mines in district 13 producers may increase their ceilings 5c a ton on domestic sizes and 15c a ton on all industrial sizes.

The effect of the latest four-day embargo, less drastic than the three-day embargo of last week, will not be known for a week or so, it was stated by ODT officials. However, Deputy Solid Fuels Administrator C. J. Potter said that early word from the field indicates that a record production of coal can be expected in the two big southern Appalachian districts where mines are working seven days a week to supply fuel critically needed to keep steel mills and other war plants in full operation. At the same time it was pointed out that some steel operations, particularly in the Buffalo area, are down because coal supplies are still stormbound and can't be delivered until released.

"If we are to keep the steel mills and war industries operating at full capacity, we must have every ton it is humanly possible for the miners to dig, particularly in districts 7 and 8," Deputy Administrator Potter said.

"Not only are war workers and their families affected by the fuel emergency, but we now have at least a dozen steel plants with less than 10 days' supply of coal. Many other war industries are critically low.

LONG, LONG TRAIL: *Mules start the long difficult climb to Fifth Army front line troops in Italy, supplying them with everything from "B" rations to generators.*

Foundry and Forge Shops Will Get Wage Increases to Attract Workers

Chicago

• • • Critical foundry and forge shops will be permitted to pay wages higher than stabilized rates for the industry, as a whole, in order to stimulate their production, Edgar L. Warren, chairman, Sixth Regional War Labor Board, told the Chicago Association of Commerce war problems school here recently.

The decision was made by the WLB with cooperation of War Production Board and War Manpower Commission because of the grave importance of production from about 30 or 40 plants in the entire industry. Probably no more than 10 are located in the Sixth region, Warren said.

Warren also estimated that correction of steel plant intra-plant inequities on the basis of what he called "a simple industry-wide job evaluation plan," called for by WLB last November, might result in average increases of 2½ to 3c. per hr. for the industry as a whole.

Warren commented that a new pattern on wage stabilization policy was evolving in recent major decisions of the national WLB, calling particular attention to two major points of departure from previous policy.

First of these is emphasis on "wage rate schedules" as distinguished from "wage rates." In contrast to the first two years of wage stabilization, when concern was expressed by both companies and unions with respect to wage rate increases, recent problems involve wage rate schedules, or getting jobs "properly lined up in relation to each other, taking into consideration such factors as efficiency, skill and production requirements of employees in the different job classifications."

Job evaluation plans presented to the board for approval involve both those engineered in detail by personnel consultants and those worked out through the processes of collective bargaining or by an employer's own personnel department. Warren said these plans may provide for the establishment of simple standards of performance for jobs of different grade levels, the writing of job descriptions, and the allotting of jobs into a number of different labor grades on the basis of the description. Warren noted that recent WLB decisions on major policy making cases have given much attention to the establishment of procedures permitting the correction of intra-plant wage inequities, citing the steel industry case in this connection.

Until recently the Sixth Regional WLB insisted that any overall job evaluation plan to correct intra-plant inequities could not increase average job rates more than ½c. per hr., he declared. Recently the regional board has considered the need of policy liberalization involving "correction of wage rate schedules by setting forth a specific type of plan which may be approved even though it does result in an overall increase somewhat in excess of the previous half cent limitation." No general wage increase will be allowed nor will all job rates be increased, Warren said.

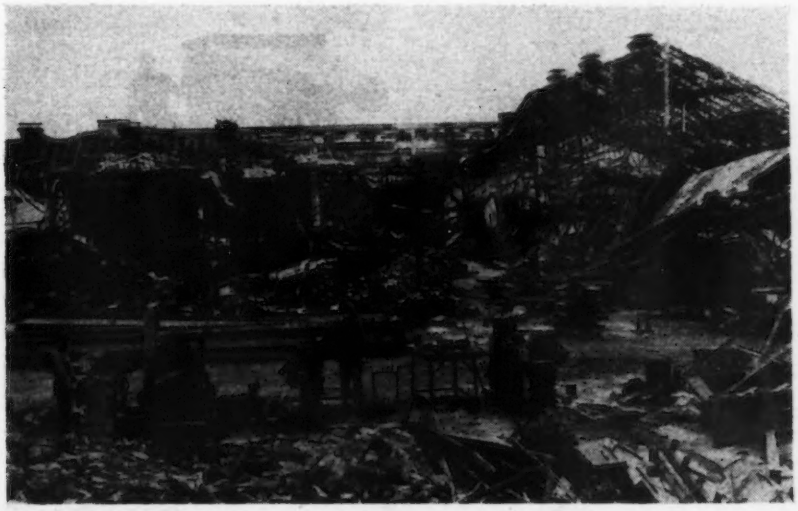
He declared that there must be a "clear showing that inequities within the present structure exist and that under such plans key rates will remain at their present level. Increased job rates will be permitted only in order to bring other rates into proper line with the rates which have been paid for the key classification."

The second major change in emphasis involved thinking by the board on industry rather than area terms in arriving at its decision in the steel cases, in the textile cases, and the packing house cases.

"The board is beginning to think of the wage problems we will face as we emerge from a wartime economy and begin to convert to a peace time economy," Warren asserted. "When labor is scarce it makes little difference to most employers about the training or experience of the particular employee and most employers have, up until the present time, been in competition with each other for the employment of labor on a purely local labor market basis. . . . The board's whole wage stabilization program has been predicated in terms of establishing local labor market rates with only a minimum amount of consideration being given to industry rates within those areas. However, as the labor supply situation changes and employers convert to the production of peacetime products, competitive market conditions become much more important. When potential workers are available in large numbers you will once again have to think primarily in terms of competition within your industry, and it will be necessary for the board, at that time, to give much more consideration to competitive cost situations than it has done in the past. For this reason it would be my guess that you may expect the board to make decisions more and more in terms of industry practices and industry rates rather than terms of area practices and area rates."

Warren also mentioned the possibility that the board will revise its policy in sub-standard wage cases to allow establishment of standard rates at different levels depending on living conditions and costs in the particular labor market area.

TWO MINUTE DESTRUCTION: *Ruins of the Matford factory in Strasbourg, Germany, after a two minute bombing by U. S. Eighth Air Force. Despite the continued heavy production of German airplanes, this attack stopped a monthly output of from 200 to 300 German airplane engines.*



Business Men Call for Prices On Western Steel on Competitive Basis

Salt Lake City, Utah

• • • **Comparatively cheaper** raw and semi-finished steel delivered on the west coast, by establishment of a new and substantially lower basing point differential in the near future, is the concerted demand of representative major fabricators, manufacturers and customers for mill products gathered here for the first business men's conference that has considered collectively the prospects and possibilities of continued expansion of far Western heavy industry postwar.

A southern California committee of eighteen principal manufacturers spent a day at the Fontana plant last week and were told by the management that the Kaiser interests are in the steel business there for keeps. The plant has proved that it can produce for an abundant volume and satisfactory quality. "At what differential price are you going to sell us at our plants after the war?" asked the visitors. "Will you make us competitive?"

When the big party of official delegates and observers toured through the great Geneva works today and were told that hot metal is now being produced at a cost of $15.00 a ton and that the quality of plates rolling out at 50,000 tons a month is proudly acclaimed by DPC as the best being made today, it looked and sounded encouraging. These fabricators like to help jobs for the West, but they all say that to buy more steel postwar than they used to, they care less whence it comes or who makes it than what it will cost delivered.

President Morris Pendleton of the Plomb Tool Co., Los Angeles, was official spokesman for the determined and united Pacific customers, and he expressed the belief that "The volume of our business and the opportunities for the expansion thereof entitle us to lower delivered cost for our steel than we are now paying or were paying pre-war." He points out that the West is now consuming several times the total production of all western mills put together. In the past seven years, the West has tripled its consumption of steel, he states. "Every other major industrial section of the country now buys its steel competitively. We intend that the West, shall too."

All four main line railroads through Utah have principal traffic offices here, and although system freight traffic Vice-President W. W. Hale of Southern Pacific blandly declared that "I do not think any power or influence the railroads might exercise will be the controlling factor in determining whether this plant (Geneva) continues operation or closes down," there was no non-railroad man present who would agree with him. Dr. Walther Mathesius has now proved that good steel can be made at as low cost in Utah as any other point in the country, but from 700 to 900 rail miles separate it from its natural market and tidewater.

An assurance especially encouraging to the embattled buyers came from F. W. Robinson, senior vice president of Union Pacific, here from Omaha. His line "and all railroads interested in Geneva steel traffic, are most desirous for postwar operation of the plant. The railroads will initiate, in cooperation with the shippers concerned, and will actively support a rate structure to further the fullest development of the Geneva plant." Mr. Hale agreed that the postwar rates could be expected to find their level at a point that would meet competition, keep the plant going, and follow his system's 75-year-old policy to develop the West and industries on its lines. Steel men attending believe an ultimate rate must be somewhere between $6.50 top and $4.00 bottom, instead of present $12.00 to the trade and $8.00 to the DPC and Maritime Commission.

If Senator Ralph O. Brewster of Maine has his way, as expressed in the final address before the conference, the federal government will sell these and other DPC plants as soon as possible when reasonable and competitive bids are received from any private parties whose operations promise to continue in the public interest.

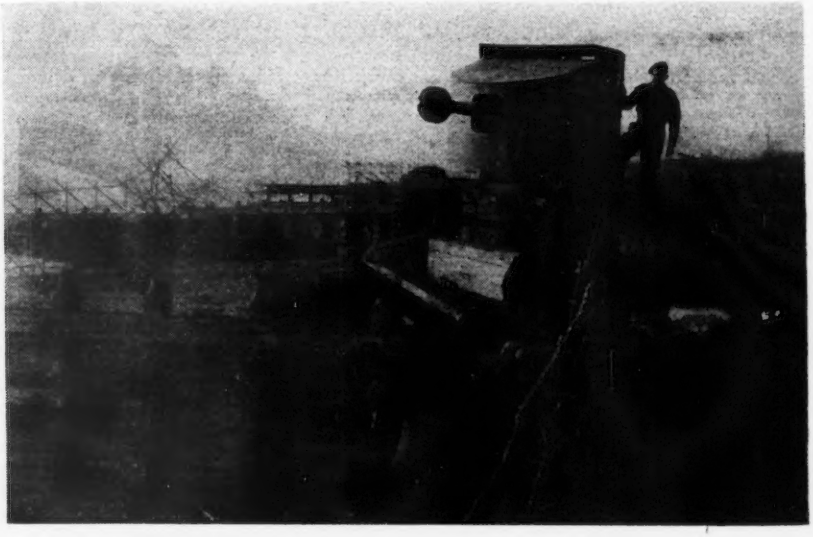
Sunday Coal Mining Delayed

Pittsburgh

• • • **While Sunday work** in coal mines has been proposed and approved, only southern mines have worked. In the western Pennsylvania area, dates have not been set because of river conditions and barge availability. The order issued is applicable only to mines shipping on the river and captive mines, and does not apply to domestic coal producing mines. Being contingent upon river conditions and barge availability, there is a possibility that mines will operate on Feb. 18.

About 5700 tons of coal were lost on Monday by a strike of 1400 miners at the Jones & Laughlin Steel Corp.'s Vesta mine No. 4 at California, Pa. The dispute is reported to be over a repair job.

HIGH PRESSURE WATER JET: *A new method of exploding beach mines by means of high pressure water jets, devised by the British Army, pumps the sea water at the rate of 2000 gal. per min. by monitors on wheeled carriages fitted with armoured cabs. The two men who operate them direct, by means of periscopes, the 200 lb. per sq. in. pressure water jet at the minefield from a range of 20 or 30 yd., thus exploding the mines.*



Bad Weather During January Cuts Steel Production to 1942 Level

New York

• • • **Bad weather during January in** several important steelmaking areas was largely responsible for reducing steel output last month to the lowest total for a 31-day month since July, 1942, according to the American Iron & Steel Institute.

A total of 7,178,315 tons of ingots and steel for castings was produced during January, as against 7,361,191 tons in December and 7,586,740 tons in January a year ago.

During January the steel plants operated at an average of 90.1 per cent of capacity rated as of midyear 1944. Since then, capacity has been increased. When the new capacity ratings as of January 1, 1945, are released, it is expected that the January output will represent about 88½ per cent of current capacity. The latter rate would be the lowest monthly since 83 per cent rate recorded in July, 1940, when the national defense program was just getting under way.

By comparison, output in December was equivalent to 92.6 per cent of the July 1 capacity, while production in January, 1944, was 95.6 of the then available capacity.

During January, steel output averaged 1,620,387 tons per week, compared with 1,665,428 tons per week in December and 1,712,582 tons per week in January of last year.

YEAR 1945

Based on Reports by Companies which in 1943 made 98.3% of the Open Hearth, 100% of the Bessemer and 87.9% of the Electric Ingot and Steel for Castings Production

Period	Estimated Production—All Companies								Calculated weekly production, all companies (Net tons)	Number of weeks in month
	OPEN HEARTH		BESSEMER		ELECTRIC		TOTAL			
	Net tons	Percent of capacity	Net tons	Percent of capacity	Net tons	Percent of capacity	Net tons	Percent of capacity		
†January	6,457,788	92.3	379,104	73.7	341,423	75.0	7,178,315	90.1	1,620,387	4.43
February										4.00
March										4.43
1st Quarter										
April										

AMERICAN IRON AND STEEL INSTITUTE

Production of Open Hearth, Bessemer and Electric Steel Ingots and Steel for Castings

YEAR 1944

Based on Reports by Companies which in 1943 made 98.3% of the Open Hearth, 100% of the Bessemer and 87.9% of the Electric Ingot and Steel for Castings Production

Period	Estimated Production—All Companies								Calculated weekly production, all companies (Net tons)	Number of weeks in month
	OPEN HEARTH		BESSEMER		ELECTRIC		TOTAL			
	Net tons	Percent of capacity	Net tons	Percent of capacity	Net tons	Percent of capacity	Net tons	Percent of capacity		
January	6,769,438	97.2	439,551	85.4	377,751	83.3	7,586,740	95.6	1,712,582	4.43
February	6,409,981	98.4	409,781	85.2	368,555	87.0	7,188,317	96.9	1,736,308	4.14
March	6,976,450	100.1	455,368	88.5	388,408	85.7	7,820,226	98.5	1,765,288	4.43
1st Quarter	*20,155,869*	*98.6*	*1,304,700*	*86.4*	*1,134,714*	*85.3*	*22,595,283*	*97.0*	*1,738,099*	*13.00*
April	6,788,433	100.6	437,472	87.8	362,118	82.5	7,588,023	98.7	1,768,770	4.29
May	6,878,251	98.7	437,444	85.0	380,960	84.0	7,696,655	97.0	1,737,394	4.43
June	6,462,108	95.8	419,699	84.2	347,028	79.0	7,228,835	94.1	1,685,043	4.29
2nd Quarter	*20,128,792*	*98.4*	*1,294,615*	*85.6*	*1,090,106*	*81.9*	*22,513,513*	*96.6*	*1,730,478*	*13.01*
1st 6 months	*40,284,661*	*98.5*	*2,599,315*	*86.0*	*2,224,820*	*83.6*	*45,108,796*	*96.8*	*1,734,287*	*26.01*
July	6,742,830	96.5	415,543	80.9	334,710	73.7	7,493,083	94.2	1,695,268	4.42
August	6,714,857	95.9	429,672	83.5	348,901	76.6	7,493,430	94.0	1,691,519	4.43
September	6,500,997	96.1	398,058	80.0	330,837	75.2	7,229,892	93.9	1,689,227	4.28
3rd Quarter	*19,958,684*	*96.2*	*1,243,273*	*81.5*	*1,014,448*	*75.2*	*22,216,405*	*94.1*	*1,692,034*	*13.13*
9 months	*60,243,345*	*97.7*	*3,842,588*	*84.5*	*3,239,268*	*80.8*	*67,325,201*	*95.9*	*1,720,112*	*39.14*
October	6,859,922	98.0	420,105	81.6	335,526	73.7	7,615,553	95.6	1,719,086	4.43
November	6,571,497	96.9	403,908	81.0	298,503	67.7	7,273,908	94.3	1,695,550	4.29
*December	6,677,488	95.6	373,323	72.7	310,380	68.3	7,361,191	92.6	1,665,428	4.42
* *4th Quarter*	*20,108,907*	*96.9*	*1,197,336*	*78.4*	*944,409*	*69.9*	*22,250,652*	*94.1*	*1,693,353*	*13.14*
**2nd 6 months*	*40,067,591*	*96.5*	*2,440,609*	*80.0*	*1,958,857*	*72.6*	*44,467,057*	*94.1*	*1,692,693*	*26.27*
* Total	80,352,252	97.5	5,039,924	83.0	4,183,677	78.0	89,575,853	95.4	1,713,387	52.28

Note—The percentages of capacity operated are calculated on weekly capacities of 1,572,755 net tons open hearth, 116,182 net tons Bessemer and 102,350 net tons electric ingots and steel for castings, total 1,791,287 net tons; based on annual capacities as of Jan. 1, 1944 as follows: Open hearth 82,223,610 net tons, Bessemer 6,074,000 net tons, Electric 5,350,880 net tons. Beginning July 1, 1944, the percentages of capacity operated are calculated on weekly capacities of 1,580,042 net tons open hearth, 116,182 net tons Bessemer and 102,757 net tons electric ingots and steel for castings, total 1,798,981 net tons; based on annual capacities as follows: Open hearth 82,604,600 net tons, Bessemer 6,074,000 net tons, Electric 5,372,150 net tons.

New Aluminum Bridge Using Hollow Sections for Ponton Flotation

Washington

• • • A new all-aluminum, 50-ton floating bridge, lighter, wider, and capable of faster construction than any ponton bridge now in use, was revealed by the War Department recently to be one of the largest users of aluminum.

Developed by the Army Corps of Engineers, to handle large, heavy loads on military bridges, the new M-4 bridge is being rushed from tests into action.

Comprising but three main parts, the bridge is so simple in design that a 301-foot section was constructed in two hours and 12 minutes in its first service test, including the time needed to unload from the trucks. "And," says Lt. Col. Jack Singleton, Chief of the Bridging Equipment Section, Office Chief of Engineers, "we've since knocked 45 minutes off that time."

The three major bridge parts, each of aluminum, are: (1) a hollow deck balk, (2) removable gunwales, and (3) half pontons.

Two half pontons, each 30 feet in length and weighing only 1700 lb., are locked stern to stern with connector pins to form a complete ponton which alone will safely support 26 tons. The bow of each half-ponton has been designed to an "ideal curve" to enable it to ride swift currents.

Removable gunwales attached to each ponton provide a foundation for the deck balk which is fixed in place with lugs and pins.

The hollow aluminum deck balk, which replaces both balk stringers and chess flooring in the older type wooden decked bridges, is in itself an innovation in bridge engineering. Fifteen feet in length, 9 x 9 inches in cross section, and 215 lbs. in weight, a single deck balk may be carried by four men; yet afloat it will support a 300 lb. load. Placed parallel to the flow of traffic, the balks are staggered to distribute the load, making the entire deck a continuous beam. The top surface of the balk is rubbed to minimize the skidding of vehicles. Disabled pontons may be unfastened from the deck with ease, towed out, and replaced. The decking itself is so buoyant that if every ponton were sunk, the deck alone could still support a loaded truck.

One M-4 bridge set will provide approximately 436 feet of floating bridge and 180 feet of fixed bridge, or a total of 616 feet. A "set" is carried in 69 trucks and trailers, with each of 64 2½-ton trucks carrying sufficient equipment to build 15 feet of bridge. Two six-ton trucks with semi-trailers transport D-7 tractors while three 4-ton trucks carry twin-screw power boats. In addition, five Quickway Cranes accompany each bridge set.

Tactically, the M-4 bridge will be used primarily in the attack, with engineers constructing the bridge in a follow-up to the assault-boat crossing. In theory, the M-4 will remain in place no longer than 4 to 5 days. It will be replaced by either a Bailey bridge or a timber trestle bridge.

The deck of the new bridge is 150 inches wide between curbs, nearly two feet wider than present military bridges. Designed and tested to carry with safety a 50-ton vehicular load in a current as swift as 10 feet per second, the bridge can carry greater loads in slower currents.

The new bridge eventually will replace several older types. The use of the half-pontons alone allows the rapid building of a lighter bridge; and trestles and pneumatic floats in each set will permit the construction of bridges over narrow ravines, or in water too shallow to permit use of the aluminum pontons.

Aluminum-Magnesium DPC Plants Will Be Feature at Hearings

Washington

• • • Senator James E. Murray, Democrat of Montana, Chairman of the Senate Committee on Small Business, has announced a series of hearings beginning Feb. 27 on the war development and postwar use of the expanded aluminum and magnesium industry, which, he said, will offer a "real prospect" for the creation of 60,000 new small business enterprises using these metals and will provide a "strong foundation" in support of the President's 60,000,000 job goal.

Underlying the Committee's efforts, the Senator declared, is the question of disposing of the Government's huge investment to stimulate healthy competition, strengthen the existing small business system and insure many new firms entering this field.

Senator Murray said the program will fit together a comprehensive picture of the past, present and future of these industries, in which the Government's investment is now almost double that of prewar private capitalization. With the objectives laid down in the Surplus Property Act as guidance for the recently established Surplus Property Board in mind, the committee will explore disposal possibilities for the Government's plants.

In addition to the employment goal, the committee will direct its inquiry toward anti-monopoly aims, the Senator explained, and it will study the small enterprise potentialities believed especially great in the fabrication of aluminum and magnesium products.

To assemble full knowledge of the industries, from raw materials to consumptive use, the committee, says the announcement, has not only drawn upon the research agencies of Government, but has also enlisted the cooperative aid of a representative complement of private industry. Principal producers, fabricators and users of the metals, as well as small enterprisers, will participate in the hearings.

Characterizing what he said is the

COMING EVENTS

April 4-6—SAE National Aeronautic Meeting, New York.
April 12-14—Electrochemical Society, Inc., Philadelphia—Atlantic City Congress, Atlantic City, N. J.

CANCELLED

Feb. 19—Annual World Trade Conference, Chicago.
Feb. 19-22—Annual meeting, Iron and Steel Division and Institute of Metals Division, A.I.M.E., New York.
Feb. 26-March 2—A.S.T.M. 1945 Committee Week, Pittsburgh.
March 19-22—American Society of Tool Engineers, Cleveland.
April—American Zinc Institute, St. Louis.
April 26-27—Annual Conference, Open-Hearth Steel Committee and Blast Furnace and Raw Materials Committee, Iron and Steel Division, A.I.M.E., Chicago.
April 30—May 4—American Foundrymen's Association, Detroit.
May—American Gear Manufacturers Association, general meeting.
May—General Meeting, American Iron & Steel Institute, New York.
American Steel Warehouse Association, 1945 Convention, New York.

temper of the committee's inquiry, Senator Murray said: "This is to be no witch hunt, but the cooperative effort of private industry, big and little, with Government to develop the full facts surrounding the light metals industries and the problems of disposing of the Government's huge holdings in them."

War requirements expanded this country's productive capacity of aluminum to seven times that of its prewar output; productive capacity of magnesium has swelled to 100 times its peacetime mark. The committee regards the aluminum and magnesium industries as significant fields in which to find answers to the problems involved in maintaining this country's postwar economy at high-income and full employment levels.

War Agencies Foreseeing Defeat for Manpower Draft

Washington

• • • **The war agencies** already have a plan to swing in to effect when the expected turn down of the "work or else" bill comes or the bill is modified in the Senate.

This plan, known as the production urgency committee plan, employs part of the theory of the socalled "Allentown Plan"—"war work or no work" and involves the imposition of employment ceilings for companies engaged in less essential activities.

The PUC plan when it is issued will require all firms to file Form 1067 with the local production urgency committees. This form is a statistical picture of production, listing manpower needs in terms of machine hours, etc.

Upon receipt of this, PUC's will impose employment ceilings upon all concerns in a locality. Firms will let United States Employment Service Offices know the names and skills of men to be laid-off under the ceiling. Men will not be immediately discharged but will be withdrawn by USES as they are needed.

Meanwhile, WPB is permitting firms which are being cutback that are required to remain in standby condition to reconvert to civilian production, if this will result in keeping the labor force until the services require the plant again. This policy, long recommended by former Chairman Donald M. Nelson and the Mead (Senate) Committee, is closely fenced in with strict requirements, but shows that the log-jam on reconversion is breaking up a little bit.

Controlled Materials Usage Is Broken Down

Washington

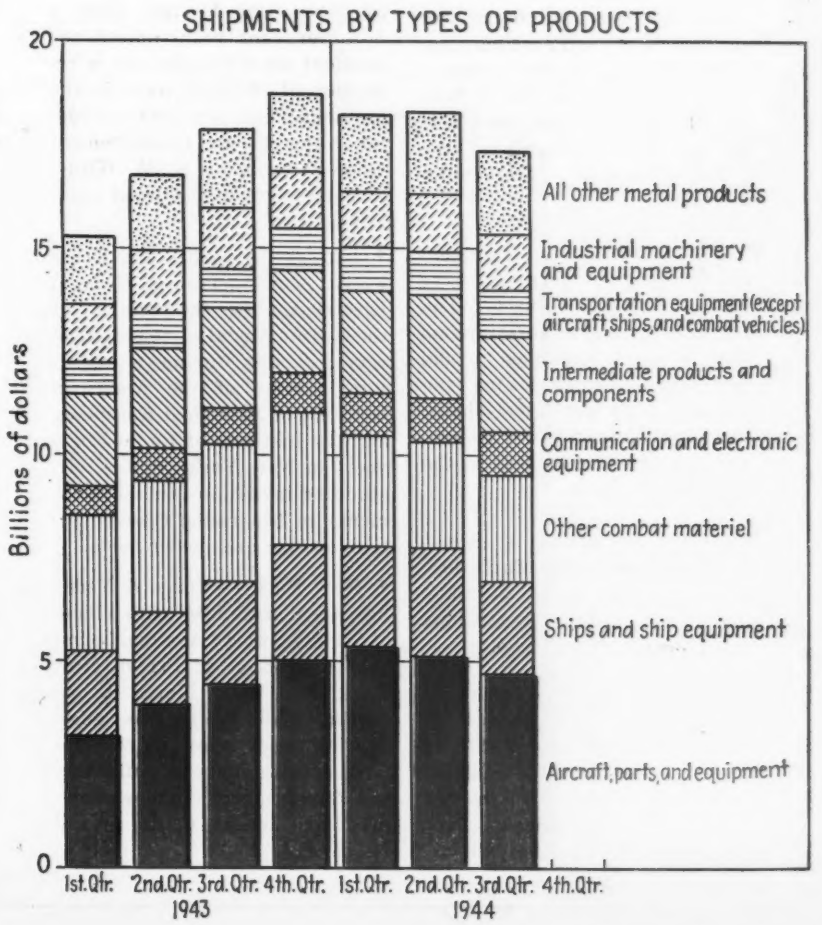
• • • **Based on wartime** operations as reported by form WPB-732, the Bureau of Census released figures on the consumption of controlled materials, steel, copper and aluminum in the second and third quarters of 1944. Consumption of each product showed a decline in the third quarter under the preceding quarter.

Carbon steel consumption in the third quarter was given as 9,700,000 tons, a drop of 1.7 per cent; alloy steel, 1,300,000 tons, a decline of 4.6 per cent; copper and copper base alloys, 1,337,000,000 lb., a decrease of 3 per cent and aluminum, 466,000,000 lb., a decline of 5.8 per cent.

Data on consumption of controlled materials distributed by class of product were reported for four quarters ending with the second quarter of 1944;

The production of combat materiel required 4,251,107 tons or 43 per cent of the carbon steel consumption in the second quarter; 610,079 tons or 46 per cent of the alloy steel; 806,158,000 lb. or 59 per cent of the copper and copper base alloys and 418,966,000 lb. or 85 per cent of the aluminum. A large proportion of intermediate products and components, not classified as combat materiel, is nevertheless incorporated in combat materiel products.

All of the material consumption data reported together with data on value of shipments were classified among 286 product classes. Of these, the five that consumed the largest quantities of carbon steel, in order of importance, were merchant vessels, 16.1 per cent of the total; ammunition, 20 mm. and above, 6.3 per cent; metal cans, 5.5 per cent; auxiliary marine vessels, 5.1 per cent; and fabricated structural steel, 4.9 per cent. Alloy steel was used to the largest extent in combat tanks and parts, 11.4 per cent; non-combat motor vehicle parts, 9.1 per cent; aircraft engines and parts, 6.7 per cent; ball and roller bearings, 5.7 per cent; and gun mounts, 20 mm. and above, 5.6 per cent.



Industrial Briefs . . .

• READY TO SERVE — Associated Engineering & Research Companies, Robert Wallach, executive director, an organization of inventors, engineers, research men and market analysts, have established offices at 150 Broadway, N. Y.

• SURPLUS WAREHOUSE—Reconstruction Finance Corp. has purchased portion of the property of the old du Pont de Nemours chemical plant at Carrollville, Wis., and will erect a number of temporary buildings to be used for storing surplus government equipment.

• BRASS FIRM GROWS — The Burlington Brass Works, Burlington, Wis., is erecting an addition to take care of increased production and expects to be operating April 1.

• SKINS FOR PLANES—Electronically controlled production of aluminum sheets or skins for bomber, fighter and other war aircraft wings and fuselages has passed its initial test successfully, it was revealed by L. Morton Morley, vice-president and general sales manager of the Brown Instrument Co., Philadelphia.

• NEW CONTRACTS — Two contracts for shell forgings have been awarded to Rheem Mfg. Co. Rheem's North Birmingham plant is being expanded to add two production lines for the forging of 90 mm. steel shells. The other contract is for 75 mm. shells also to be produced in the Birmingham area.

• ELECTS PRESIDENT — Resistance Welder Manufacturers' Association at their January meeting in Detroit elected Chas. Eisler president for 1945.

• JOINS STAFF — William H. Safranek, Jr., and Lester F. Clawson have joined the staff of Battelle Institute, Columbus, Ohio. Mr. Safranek will be engaged in electrochemical research and Mr. Clawson will assist in research on product design and production methods.

• DPC AUTHORIZATION—Execution of a contract with Lee Way Motor Freight, Inc., Oklahoma City, Okla., to provide transport equipment for operation in the State of Oklahoma and adjacent states at a cost of approximately $40,000. Lee Way will operate these facilities, title remaining in Defense Plant Corp.

• DOUBLES OUTPUT — American Can Co.'s production of Navy bomb fuse containers will be more than doubled in 1945, according to a recent announcement by the company. Approximately 6,000,000 were manufactured last year and 1945 production schedules call for a minimum of 15,000,000, W. C. Stolk, vice-president, said.

• CUTS ACCIDENT RATE — Improved working conditions and intensified safety campaigns in the plants and mines of Republic Steep Corp. brought about a 46.4 per cent reduction in the accident severity rate and a reduction of 20.03 per cent in the accident frequency rate in 1944, according to an announcement made recently by C. M. White, vice-president in charge of operations.

• HIGHEST AWARD — Dr. Ernst F. W. Alexanderson of General Electric Co. was the recipient of the Edison Medal of 1944, which was awarded during a recent joint session of the American Institute of Electrical Engineers and the Institute of Radio Engineers in New York, for his outstanding inventions and developments in the radio, transportation, marine and power fields.

• NEW FIRM — Jones & Yoder has been organized with offices at 5500 Walworth Avenue, Cleveland; 110 East 42 Street, New York, and 3701 North Broad Street, Philadelphia, as engineering and sales representatives of machinery manufacturers. The heads of the new enterprise are Joseph C. Jones and Leonard A. Yoder.

Maritime Surpluses Sell at 81 Per Cent Of Government Cost

Washington

• • • **The newly created Contract Settlement and Surplus Materials Division of the Maritime Commission has reported sales during the last quarter of 1944 of used surplus materials totaling $2,047,974, a recovery of 81 per cent of the government cost of $2,526,718. Items sold included winches, marine engines, small craft, and other items. Commission officials said that they consider the percentage of recovery an outstanding accomplishment in surplus disposal activity. The Commission attributed the high recovery to the division's selling program which was described as "vigorous and aggressive."**

Under the division's policy, materials turned over for disposal are first thoroughly inspected. Sales promotion includes a study of the items and improvisations of new uses to make the items salable to markets other than the restricted marine channels. A "fixed price" has generally been adopted rather than selling through bids, negotiated prices or auctions.

The "fixed price" policy was adopted, the Commission said, for the following reasons:

1. It eliminates long dickering periods.

2. Establishes fair and square treatment for all purchasers whether buying small or large lots.

3. Obtains quick turnover where the purchaser could make his selection, pay the purchase price asked and obtain immediate delivery.

4. Eliminates tie-up of capital used for good faith deposits pending ultimate awards.

5. Permits full publicity covering all transactions.

Full information on items to be sold is publicized at least 30 days in advance of the date of opening sale, enabling prospective purchasers to make complete inspection and consider arrangements for transportation and delivery.

Prospective buyers desiring information on items available for sale and prospective sales can write or contact the Materials Disposal Section, Contract Settlement and Surplus Materials Division, Maritime Commission.

Steel Shipments Beat Previous Peak By Over One Million Tons in 1944

New York

• • • **Shipments of finished** steel in 1944 set a new record of 63,235,000 tons, a gain of 1,025,000 tons over the total shipped in 1943 according to the American Iron & Steel Institute. Excluded in that total are the tonnages of steel shipped from one steel company to another for further processing.

New records were established during 1944 for shipments of seamless pipe and tubing, 2,356,000 tons; finished black plate, 610,000 tons; mechanical tubing, 805,000 tons; cold finished carbon bars, 1,775,000 tons; and semifinished steel, 8,701,000 tons.

Shipments of hot and cold rolled sheets, galvanized sheets and hot and cold rolled strip, although not setting new records, showed gains in comparison to 1943 totals.

Similarly in 1944 there were increased shipments of steel piling, butt-weld and lap-weld pipe, conduit, rails and fastenings, concrete reinforcing bars, tin plate, and drawn wire.

Shipments of steel plates fell off last year from the record deliveries of 1943, amounting to 12,866,000 tons, compared with 12,967,000 tons in 1943.

Decreases in shipments between 1943 and 1944 also occurred in the case of hot rolled and cold finished alloy steel bars, hot rolled carbon bars, tool steel bars, electric weld pipe, miscellaneous wire products and structural shapes.

Monthly shipments during 1944 were ahead of the corresponding months of 1943 except in the last three months of the year, when they fell behind the tonnage, in the corresponding months of 1943. Ingot production began falling behind the preceding year in September, a month earlier than shipments, but in December, 1944, was again ahead of output in the corresponding month of the year before.

Reynolds Designs Light Weight Ice Refrigerator Car

Chicago

• • • **Adding to already** announced designs for postwar aluminum railroad cars is a proposed refrigerator car, whose design has been conceived by Reynolds Metal Co. Emphasis is placed on reduction of ice consumption in the car, and the use of the light metal would decrease the weight from that of a conventional car by approximately 18,000 lb.

The design calls for a superstructure of aluminum alloy, and underframe and trucks to be made of steel. Reynolds has already sold thirty aluminum box cars to three railroads and also recently announced a design for a hopper car to be built of the light metal.

AMERICAN IRON AND STEEL INSTITUTE
CAPACITY, PRODUCTION AND SHIPMENTS

Period DECEMBER - 1944

Steel Products	Number of companies	Items	Maximum Annual Potential Capacity Net Tons	Current Month: Production: Net Tons	Current Month: Production: Per cent of capacity	Current Month: Shipments (Net Tons): Total	Current Month: Shipments (Net Tons): To members of the industry for conversion into further finished products	To Date This Year: Production: Net Tons	To Date This Year: Production: Per cent of capacity	To Date This Year: Shipments (Net Tons) *: Total	To Date This Year: Shipments (Net Tons) *: To members of the industry for conversion into further finished products
Ingots, blooms, billets, tube rounds, sheet and tin bars, etc.	51	1	xxxx	xxxx	xxx	680,817	199,143	xxxx	xxx	8,701,186	2,747,778
Structural shapes (heavy)	11	2	9,429,250	321,526	42.7	302,462	xxxx	3,834,708	42.1	3,835,601	xxxx
Steel piling	4	3		18,472		21,204	xxxx	137,662		132,513	xxxx
Plates (sheared and universal)	27	4	17,583,220	868,919	58.5	864,807	45,415	13,192,660	75.0	12,866,213	625,061
Skelp	6	5	xxxx	xxxx	xxx	68,996	60,062	xxxx	xxx	839,189	668,274
Rails—Standard (over 60 lbs.)	4	6	3,625,000	188,664	61.6	195,200	xxxx	2,305,303	63.6	2,290,779	xxxx
—All other	6	7	526,000	12,529	28.2	13,657	xxxx	185,878	35.3	192,671	xxxx
Splice bars and tie plates	13	8	1,747,260	52,049	35.2	54,108	xxxx	769,949	44.1	789,285	xxxx
Track spikes	10	9	350,640	12,386	41.8	13,163	xxxx	147,376	42.0	156,260	xxxx
Hot Rolled Bars—Carbon	39	10	xxxx	675,024	xxx	554,362	80,068	8,658,581	xxx	7,121,278	933,526
—Reinforcing—New billet	15	11	xxxx	54,928	xxx	63,391	xxxx	543,628	xxx	573,998	xxxx
—Rerolled	14	12	xxxx	3,898	xxx	4,064	xxxx	67,342	xxx	79,524	xxxx
—Alloy	25	13	xxxx	241,759	xxx	175,867	18,055	3,064,638	xxx	2,241,525	237,667
—Total	47	14	22,264,720	975,609	51.8	797,684	98,123	12,334,189	55.4	10,016,325	1,171,193
Cold Finished Bars—Carbon	24	15	xxxx	141,557	xxx	139,527	xxxx	1,786,599	xxx	1,775,046	xxxx
—Alloy	23	16	xxxx	29,308	xxx	24,885	xxxx	413,854	xxx	372,927	xxxx
—Total	30	17	2,940,910	170,865	68.7	164,412	xxxx	2,200,453	74.8	2,147,973	xxxx
Tool steel bars	17	18	271,460	12,658	55.2	12,577	xxxx	147,369	54.3	141,684	xxxx
Pipe and Tubes—Butt weld	16	19	2,162,520	116,910	63.9	122,235	xxxx	1,435,674	66.4	1,437,910	xxxx
—Lap weld	8	20	842,200	45,599	64.0	46,306	xxxx	577,602	68.6	574,242	xxxx
—Electric weld	10	21	1,344,900	73,273	64.4	75,742	xxxx	859,929	63.9	857,119	xxxx
—Seamless	15	22	2,678,100	180,117	79.6	191,963	xxxx	2,336,555	87.2	2,356,483	xxxx
—Conduit	7	23	187,000	7,051	44.6	6,524	xxxx	63,596	34.0	63,489	xxxx
—Mechanical tubing	12	24	1,117,600	65,375	69.2	59,994	xxxx	826,542	74.0	805,421	xxxx
Wire rods	27	25	7,058,470	362,464	60.7	98,304	32,927	4,610,251	65.3	1,365,127	435,453
Wire—Drawn	42	26	5,653,440	285,720	59.8	179,781	9,575	3,652,728	64.6	2,178,345	104,294
—Nails and staples	19	27	1,249,020	46,413	44.0	48,262	xxxx	642,497	51.4	635,388	xxxx
—Barbed and twisted	15	28	546,390	20,276	43.9	20,924	xxxx	253,788	46.4	251,990	xxxx
—Woven wire fence	16	29	1,106,200	31,937	34.2	32,354	xxxx	384,879	34.8	382,205	xxxx
—Bale ties	12	30	152,500	5,167	40.1	5,198	xxxx	75,235	49.3	76,156	xxxx
Black Plate—Ordinary	9	31	xxxx	xxxx	xxx	34,820	239	xxxx	xxx	489,222	1,504
—Chemically treated	8	32	464,000	6,999	17.8	7,226	xxxx	126,950	27.4	120,695	xxxx
Tin and Terne Plate—Hot dipped	9	33	3,718,850	165,545	52.7	172,844	xxxx	1,992,276	53.6	2,000,317	xxxx
—Electrolytic	10	34	2,173,850	58,567	31.9	61,043	xxxx	649,556	29.9	604,968	xxxx
Sheets—Hot rolled	29	35	19,536,820	1,109,461	67.2	508,791	30,255	12,865,583	65.9	6,413,344	300,965
—Cold rolled	12	36	7,072,260	371,507	62.1	194,157	xxxx	3,826,140	54.1	2,031,477	xxxx
—Galvanized	16	37	2,892,130	132,394	54.1	129,108	xxxx	1,389,866	48.1	1,378,077	xxxx
Strip—Hot rolled	23	38	7,117,390	210,405	35.0	130,511	17,058	2,671,962	37.5	1,703,148	264,621
—Cold rolled	36	39	3,146,110	113,312	42.6	103,253	xxxx	1,270,281	40.4	1,191,365	xxxx
Wheels (car, rolled steel)	5	40	319,400	25,687	95.1	25,839	xxxx	300,429	94.1	296,499	xxxx
Axles	6	41	408,170	8,711	25.2	10,162	xxxx	186,921	45.8	184,726	xxxx
All other	5	42	168,790	4,146	29.1	3,705	xxxx	48,018	28.4	46,523	xxxx
TOTAL STEEL PRODUCTS	155	43	xxxx	xxxx	xxx	5,458,133	492,797	xxxx	xxx	69,552,911	6,319,143
Effective steel finishing capacity	155	44	64,722,000	xxxx	xxx	xxxx	xxxx	xxxx	xxx	xxxx	xxxx
Percent of shipments to effective finishing capacity	155	45	xxxx	xxxx	xxx	90.7 %	xxxx	xxxx	xxx	97.7%	xxxx

During 1943 the companies included above represented 98.9% of the total output of finished rolled steel products as reported to American Iron and Steel Institute.

* Adjusted.

Cleveland Ordnance District Increase Output by $1 Billion

Cleveland

• • • **Keyed to war production's quickening** tempo, Cleveland Ordnance district output during 1944 totaled $3,257,366,000 representing an increase of more than a billion dollars over 1943, according to the annual report of Col. E. A. Lynn, district chief.

Indicative of the Armed Forces' accelerated consumption of war materiel, the report showed that 450 new contracts and awards amounting to approximately $115,000,000 were issued during the last three months of 1944, bringing the total of prime contracts and purchase orders now held by this Ordnance district to $2,323,662,961.

Emphasizing the importance of labor's role in district plants, Colonel Lynn stated that while the value of materiel produced under prime contracts amounted to $715,058,180, production was supervised on inspection requisitions valued at more than $2,500,000,000 for other Ordnance districts.

Production of components throughout this district, which includes the 55 northern counties of Ohio and three border counties of Pennsylvania, was five times greater in the last quarter of 1944 than it was in the first quarter. The report also revealed that 1944's production tonnage amounted to more than a million tons, or enough to fill about 65,000 freight cars.

In summarizing the types of materiel produced, Colonel Lynn mentioned the following:

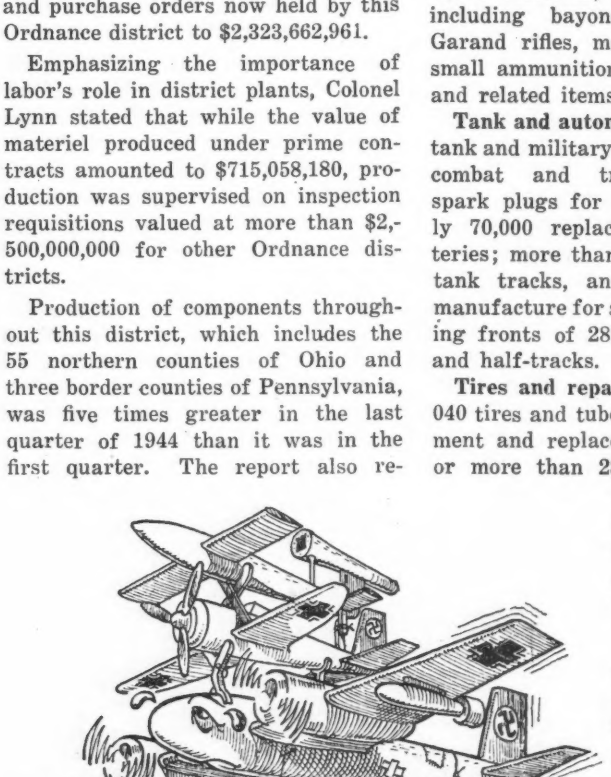
Ammunition: 38,072,155 mortar and cannon shell; 38,571,200 fuzes for shell, bombs and grenades; 5,002,109 bombs and grenades; 41,439,200 primers; 3,963,677 mines; 4,502,134 bomb parts of various kinds; 55,701,359 ammunition containers, grommets and other shipping materials; 2,174,900 boosters; 35,086,893 cartridge cases; 109,140,000 detonator parts, and almost a million ground signals.

Artillery and Small Arms: 1,312,199 cannon, carriages, optical and fire control instruments, spare parts and accessories; 242,206,596 weapons including bayonets, carbines, and Garand rifles, machine gun mounts, small ammunition items, spare parts and related items.

Tank and automotive items: 143,934 tank and military vehicles of all types, combat and transport; 7,723,800 spark plugs for replacements; nearly 70,000 replacement storage batteries; more than 50,000 engines and tank tracks, and the complete remanufacture for shipment to the fighting fronts of 2828 tanks, scout cars and half-tracks.

Tires and repair materials: 9,010,040 tires and tubes for original equipment and replacement; 5,712,767 lb., or more than 2856 tons, of "camel back", cotton cord, lamp black and other types of repair and tire manufacturing materials.

Switching to the gloomy side of the production picture, Colonel Lynn pointed out that conditions on the western front were such that 5000 tires were damaged beyond repair every day in combat, and that more than 900 two-and-one-half ton trucks and 1500 jeeps were ruined every month. Furthermore, about 375 medium tanks are put out of action for good every month and in the same period, 125 light tanks are destroyed.



The Pick-a-back-a-back-a-back.
From Aeroplane

Maritime Commission Creates Surplus And Settlement Division

Washington

• • • **The Maritime Commission** has announced the creation of a Contract Settlement and Surplus Materials Division. This division is charged with the settlement of claims under terminated war contracts for supplies, shipbuilding and facilities and with the redistribution of unrequired materials as well as the disposal of surplus property, except vessels. Comprising this new division are the Settlement, Materials Utilization and Materials Disposal Sections in Washington. Maritime Settlement offices are in Chicago, New Orleans, Oakland, Calif., and Philadelphia.

The director is generally charged with the performance of Maritime Commission functions under the terms of the Contract Settlement Act of 1944, the Surplus Property Act of 1944 and the various regulations issued by the Office of Contract Settlement and the Surplus Property Board. He is authorized to make or approve binding settement of war contractors' termination claims not in excess of $10,000; to grant partial payments not in excess of $10,000 on a single claim or $50,000 on all unsettled claims of any single prime contractor and to recommend settlements.

The Commission has appointed Burton L. Hunter, formerly of Los Angeles and Honolulu, as director. For the last four years, Mr. Hunter, on the staff of the Bureau of the Budget, has been in charge of appropriation estimates for the Maritime Commission, the War Shipping Administration, and the Navy, State and Commerce Departments.

Iron Workers Granted New Wage Increases

Chicago

• • • **New and higher wage** rates to correct interplant and intraplant inequities have been approved by the Sixth Regional War Labor Board for employees of Illinois Malleable Iron Co., Chicago.

About 210 workers were awarded varying increases, retroactive to Aug. 14, 1944, for all but malleable and gray iron piece work molders, for whom the retroactive date was fixed as Sept. 18, 1944. The application was based on the increased production required of a limited manpower supply.

Canadian Output for 1944 Falls Below Record; Exceeds 1943

Toronto

• • • **Iron and steel** production in Canada for the year 1944 was the second highest yearly record in history, being exceeded only by the output for the record year 1942. Last year pig iron output totalled 1,852,628 net tons, which is an increase of 5.3 per cent over the $1,758,265 tons reported for the year immediately preceding. In the year under review pig iron output included 1,534,140 tons of basic iron, of which 102,301 tons were for sale while the remainder was used in steel making operations by the producing companies; 143,762 tons of foundry iron and 174,726 tons of malleable iron, all the latter two grades being for sale.

Iron blast furnace charges during the year included 3,478,803 net tons of iron ore and 101,454 tons of scrap iron and steel. At the end of 1944 there were 14 blast furnaces in Canada with total rated capacity of 2,770,760 net tons located as follows: Dominion Steel & Coal Corp. Ltd., Sydney, N. S., 4, with total capacity of 730,000 net tons; the Steel Co. of Canada, Ltd., Hamilton, Ont., 3, with total capacity of 757,000 net tons; the Algoma Steel Corp., Sault Ste. Marie., Ont., 5, total capacity 1,062,000 tons; and Canadian Furnace Ltd., Port Colborne, Ont., 2, with total capacity of 221,760 net tons.

In the month of December pig iron production at 139,152 net tons indicated an average rate of 60.2 per cent which compares with 146,972 tons in November and 137,256 tons in December, 1943, and against an average production rate of 66.8 per cent for the full year. The decline in output for December is credited largely to the heavy snowfall which swept over Ontario about the middle of that month which kept thousands of workers away from their plants and also made the movement of raw materials from mill yards to furnaces practically impossible for several days.

Production of ferro-alloys in 1944 amounted to 182,428 net tons compared with 218,687 tons in the year immediately preceding. For the month of December output of ferro-alloys was 12,391 net tons against 15,280 in the previous month, and 17,038 tons in December a year ago. In the month under review the following alloys were produced, ferrosilicon, silicomanganese, ferromanganese, spiegeleisen, silicospiegel, ferrochrome, chrome-x and ferrophosphorous. Steel production in 1944 totalled 3,024,410 net tons compared with 2,996,978 tons in 1943 and 3,121,361 tons in the record year 1942. Last year production included 2,878,407 net tons of steel ingots and 146,003 tons of steel castings. Pig iron and scrap charged to steel furnaces in the year included 1,511,518 tons of pig iron, 1,007,473 tons of scrap of consumers own make and 842,471 tons of purchased scrap.

At the end of 1944 Canada's rated capacity for the production of steel ingots was 3,338,200 tons of which 2,765,000 tons was basic open hearth and 573,200 electric. The capacity for producing steel castings was 252,800 net tons.

For the month of December output of steel ingots and castings amounted to 243,482 net tons, against 268,923 tons in November and 227,822 tons in December a year ago. In the month under review 229,562 tons of ingots and 13,920 tons of castings were produced.

The following table shows production figures for iron and steel in Canada covering the years 1930 to 1944 inclusive in net tons:

Year	Pig Iron	Steel Ingots	Steel Castings	Ferro-Alloys
1930	836,839	1,072,321	60,830	73,049
1931	470,442	744,605	41,501	52,375
1932	161,425	349,843	25,664	18,100
1933	254,592	441,346	17,830	33,737
1934	455,789	827,041	23,116	37,055
1935	678,302	1,016,814	35,123	62,182
1936	759,618	1,211,334	38,337	87,678
1937	1,006,717	1,496,575	74,652	91,931
1938	789,710	1,238,078	56,636	59,720
1939	846,418	1,266,056	60,997	85,531
1940	1,309,161	2,177,973	77,899	151,661
1941	1,528,054	2,578,063	123,250	213,218
1942	1,975,015	2,942,921	178,440	213,636
1943	1,758,265	2,848,235	148,743	218,687
1944	1,852,628	2,878,407	146,003	182,428

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RECORD CONSTRUCTION: *Less than* 12 *hr. after the capture of Kalewa,* 14*th Army troops launched assault crossings over the River Chindwin. Soon after Bengal sappers and miners spanned the river with a* 1096 *ft. long floating Bailey Bridge, believed to be the largest ever built. The bridge sections were brought from Calcutta over* 320 *miles away and assembled up the river because of enemy fire.*

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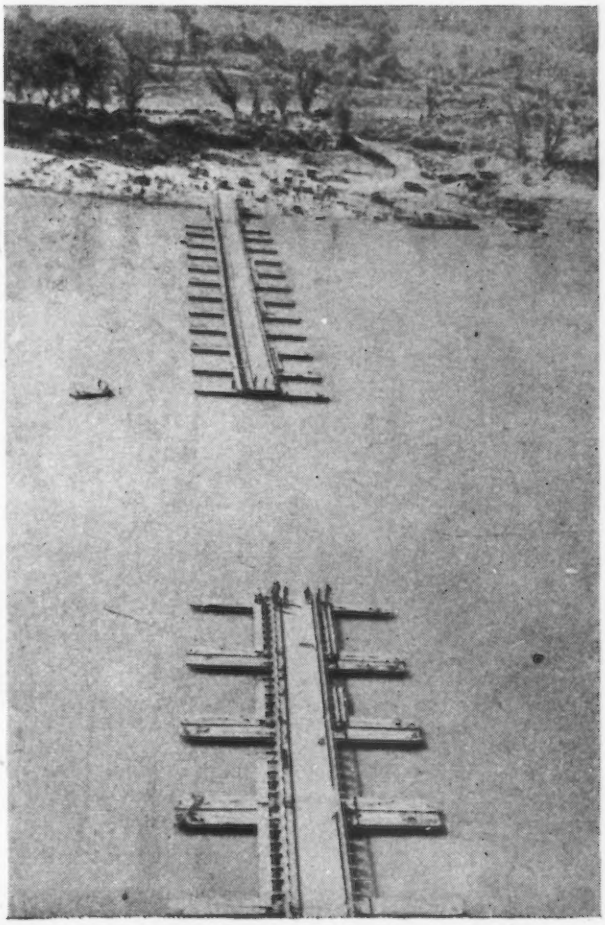


Trade Experts Say France May Want To Produce Own Reconstruction Goods

Washington

• • • Trade experts from abroad who have recently arrived in this country, point out that France may want to produce within her own borders a great deal of goods for reconstruction and consequently American companies may be interested in establishing French subsidiaries to carry out this purpose. Possibility is that American steel and machine tool companies will be invited to establish French subsidiaries.

French metallurgy and machine tool building techniques for example were far behind those of the United States before the war and it seems that mutual benefits would be derived from increased industrialization, it was said.

Thus France would have to turn to manufacturing pursuits to a greater degree than before the war, more especially in view of the rehabilitation problems raised by the return of 2,000,000 Frenchmen from forced labor in German factories. No one knows what physical condition these men are now in or how many of them may have experienced untold rigors of the concentration camps.

It was pointed out that France and other markets in Europe would be open to subsidiaries of American industry so established and the French economy would benefit through greater employment, increased revenues and rehabilitated industry.

Aside from Allied need for the war output of liberated French industries, which is to be financed through lend-lease, France looks to the postwar purchase of American capital goods and expects to pay for them. This can only be done if France can produce on a large scale and export.

The Germans took 75 per cent of French locomotives and freight cars and with present military operations taking a great percentage of what was left, France is in dire need of transportation equipment of all kinds.

Shipping needs are great and there is not enough space to transport urgently needed coal from America. Supplies can not come until the Saar region is captured by Allied armies. The French will be able to supply, with American assistance, a great deal of things needed for the allied war effort when her shut down industries are again manned.

FEA has been asked to supply 500,000 tons of finished steel products during the first half of this year, and about $40,000,000 worth of machine tools. If surplus tools are not available, then the machine tool demands will have to wait upon the order backlogs which confront the American industry now producing about $40,000,000 worth of tools monthly.

It is permitted for the 6000 to 7000 tools to be shipped to France to be used in war production to be war models, but the tools to be purchased for reconstruction will be the latest postwar models.

Asked if there is any solution to the problem of disparity in exchange between the dollar and the franc, and repetition of bad feeling on both sides of the Atlantic that was the aftermath of Post-World-War I loans for similar purposes the trade experts said that the United States must realistically prepare for greater exchange of raw materials and goods. Settlements would be made under the rules laid down for international currency stabilization and exchange at the Bretton Woods monetary conference.

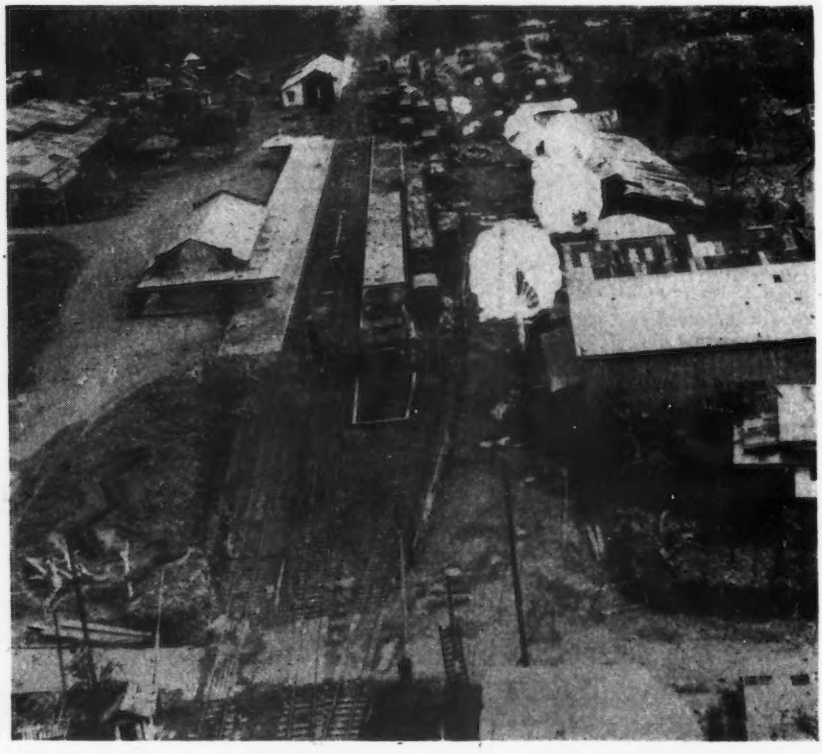
To prevent inevitable default by France and other European nations, and repetition of the pattern for financing reconstruction in World War I, the same people believe in the value of the plan originating in this country for all nations to meet at the peace table, list their raw materials and agree to a mutual sharing of them at reasonable prices. Governments would strike-off periodic balances.

Tariff balancing is one way this country has attempted to effect greater exchange of goods prior to the war through reciprocal trade agreements. The purpose was to favor the industries of nations which are most economical and efficient producers.

It is assumed that to greatly increase trade between the United States and other nations, the peace table will see tariff trading on a scale never before accomplished.

At the Bretton Woods conference it was agreed that exchange quotas would be assigned to each country; each country would furnish 10 per cent of its gold reserve, or 25 per cent of its quota in gold, whichever is the lower. The board of directors of the world bank could permit countries to exceed their exchange quotas and substitute their own currency for gold reserves.

PARACHUTE BOMBS: *Japanese railroad installations in southeastern Luzon are feeling the impact of parachute bombs used in low level bombings. More than 300 freight cars and 26 locomotives have been destroyed in this area to date by Air Force activity.*



Says Foundry Industry Melted 23 Million Tons of Metal in 1944

New York

• • • **During 1944 the ferrous segment**—steel, malleable, gray iron—of the foundry industry melted approximately 23 million tons of metal, according to Donald J. Reese, chief, Manufacture and Products Section, Metallurgical and Conservation Branch, WPB Steel Division. During that year this segment of the industry was under continual pressure to meet military and critical civilian requirements. Up to the present time this pressure has not lessened, and current forecasts for 1945 indicate increasing requirements. Mr. Reese told members of a War Production and Future Planning Conference here Jan. 30:

D. J. Reese

"The foundry industry's No. 1 problem has been, and is, manpower. Its manpower problem is more acute than that of most of the metal industries not only because its best workers have been taken into the services while others have been attracted to the glamour industries, but also, in a real sense, because it was not recognized early in the war that some of the materials processed in the foundry industry were needed to fight and win a war. With curtailment of civilian production of automobiles, farm and railroad equipment, etc., the major part of the foundry industry suffered a business lull until the essentiality of its materials was recognized. During the early part of 1942 the malleable foundry industry declined to 30,000 product tons per month. During 1944, however, these same foundries were struggling to reach a 100,000 product tons per month performance, with a backlog of up to 540,000 tons and an actual performance, in the last three months of the year, of 80,000 tons. During the business lull they lost manpower to other war industries.

"During 1944 the foundry industry suffered considerably from unfavorable publicity. It was tagged with such terms as 'hot,' 'heavy,' 'dirty,'

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NEWS OF INDUSTRY

'onerous,' and 'low paid.' Workin conditions in the foundry industry ar on a par with other metal industrie Generally, the foundry industry coul improve its housekeeping; and i working conditions are not always a attractive as they might be. Howeve the foundry with the most favorabl working conditions has had no less manpower or absenteeism proble than the average. Generally, th wages in the foundry industry com pare favorably with those of othe long time industries in the same are The industry is not only anxious t correct its weak spots, but has a sin cere desire to be one of this country respected industries for another hun dred years.

"The foundry industry is seldom prime contractor and frequently is sub-sub contractor. Since it turns ou many millions of component parts eac month for this country's war an peace production, it is difficult to de termine whether some less essenti part is in production while some mor important part is not; and, of course scheduling errors made at any leve above the foundry reflect a loss o production while a change to the re quired part is being effected.

"The Controlled Materials Pla brought considerable order out o chaos but the plan was limited t steel, copper and aluminum. It is un fortunate that the term steel was no broadened to include iron and stee as this would have included gray iro and malleable iron and possibly woul have directed more effort toward es tablishing real requirements and t the putting of first things first.

"For generations the foundry pro ess of manufacture consisted of pou ing molten metal into refractory san molds. For some years now the indu try has been working on its moldin technique to achieve dimensional a curacy in the component parts pr duced by the industry. I refer to th use of metal (permanent) molds, a setting cement bonded silica san molds, the Fisher process, investmen molding (lost wax process), etc. Ce tain centrifugal casting techniqu also achieve high dimensional acc racy but the utility of this develo ment aims to improve the material a well as certain founding procedures

"To the best of my knowledge n one knows the dollar value of th products of the overall foundry indu try. During 1944 it probably a proached 3 to 3½ billion dollars. Th industry employs approximately 40 000 to 450,000 people.

"The following production w

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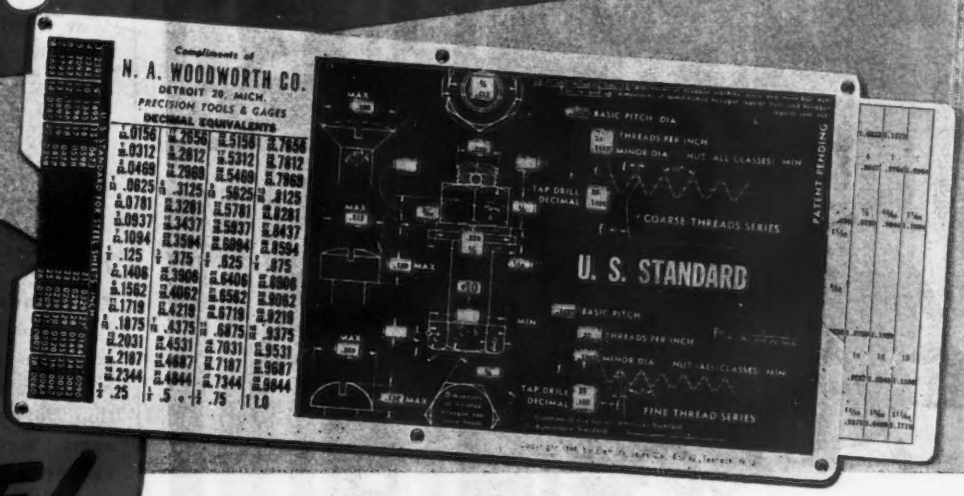

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achieved in 1943 and 1944 for cas steel, gray iron, malleable iron, alu minum and magnesium.

Product	Product-Tons 1943	1944
Gray Iron	10,000,000	10,000,00
Steel	2,740,000	2,450,00
Malleable	850,000	900,00
Aluminum	230,000	258,00
*Magnesium	33,000	39,00

*Excludes incendiary bomb production

"These figures are from published War Production Board data, excep for minor adjustments of my own and some extrapolation from monthly pro duction to an annual basis."

Ordnance Modifying Plant Closing Edic

Buffalo

• • • **Buffalo Arms Corp.** has received permission from Army Ordnance to utilize part of the plant owned by the Defence Plant Corporation for manufacture of ordnance parts, according to Ralph F. Peo vice-president. The factory halted machine gun production on Jan. 31 on orders of the Army to permit the release of employees for "more pressing" war work. Relatively few of the workers, many of whom are women have taken jobs in "must" plants, it is reported.

A staff of 600 workers is engaged in changing over the plant to a "standby" position, which would permit resumption of machine gun output on short notice.

"Before this work is completed, we expect to complete negotiations for enough subcontracting work to keep operating at a high rate in the portion of the plant in which we are permitted to do this type of work," Mr. Peo said. "I think we can build up this force by several hundred additional workers in the next few months. We might produce parts for artillery, guns, ammunition or tanks. In any event there is no question that Buffalo Arms will continue to operate on a very sizable scale. But we will not manufacture bombs, as has been reported."

The order to close the plant and gradually lay off most of the 2500 employees on the payrolls early in December aroused a storm of protest from the independent United Victory Workers' Union. Subsequently U. S. Senator James M. Mead interceded at Washington and won modification of the closing edict.

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Umbrellas are not always for weather protection. To the Navy the "umbrella" is the protecting layer of five-inch anti-aircraft gun fire during enemy attacks, an "umbrella" that keeps heavy bombers high and ineffective.

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Large Helium Supply Now Available For Industrial Utility

New York

• • • A vast store of helium—government controlled — is being made available for industrial applications by the Bureau of Mines from their Amarillo, Tex., helium plant.

Improvements which have been made in the methods of producing helium, together with the development of blimp envelopes more nearly gas tight than ever before, have resulted in an appreciable supply of helium which can be made available to industry, according to General Electric Co.

Helium is extracted from natural gas before that gas is burned for industrial purposes. Previously all such helium went to market with the parent gas and was thus lost forever. Now, however, large quantities are recovered to be put to useful purposes.

While the natural gas is on the way to the ultimate consumer, it is sidetracked into one of the Bureau's five helium plants where it is cooled to about 300 deg. below zero F. Under a pressure of about 600 pounds per sq. in., practically all of the gas, except the helium and a small amount of nitrogen, become liquid. The helium is separated for future use and the liquid natural gas warmed and returned to the pipelines to continue its course to the market.

The purity of the helium produced by the Bureau of Mines is accurately controlled and it is continually measured by recording instruments. Helium is not allowed to be shipped which has a purity of less than 98 per cent. Normally, the helium analyzes 98.4 per cent. The residue is chiefly nitrogen.

Nothwithstanding the fact that the helium as now sold has an acceptable purity, preparations are being made to produce a higher grade of material when the demand warrants.

Substantially all of the commercial helium sold in the United States comes from the plant of the Bureau of Mines at Amarillo, Tex. However, it is sold principally to large distributors who often find it necessary to transfer the material to other containers. This operation must be conducted with great care to prevent contamination.

Helium is sold by the Bureau of Mines approximately at cost and since the cost cannot be determined until the end of the fiscal year, purchasers of helium are required to make a de-

posit on the basis of an estimated cost. When accurate figures for the year are available, refunds are made in the event the deposit has exceeded the cost.

At the present time, the estimated base price of helium is $11.75 per thousand cu. ft., f.o.b. customers' containers, Amarillo, Tex. However, to provide for errors in the estimate, purchasers must deposit $15.80 for one thousand cu. ft. of helium on demand. An application must be made to the Bureau of Mines, Washinton, D. C., to purchase the helium required, and later one must enter into a contract for the quantity desired. The containers for the helium shipments must be supplied by the producer.

Large shipments of helium are made to the military arms of the Government in Army- and Navy-owned tank cars which hold about 200,000 cu. ft. of helium. For large users this manner of shipping helium is very economical as it obtains a very favorable freight rate. It is hoped that eventually such cars can be made available to large commercial users of helium through nominal rental charges.

Prior to the filling of shipping containers the helium produced at the Amarillo plant is passed under pressure through a bed of activated bauxite which gives further assurance of a dry gas, free from oil vapors.

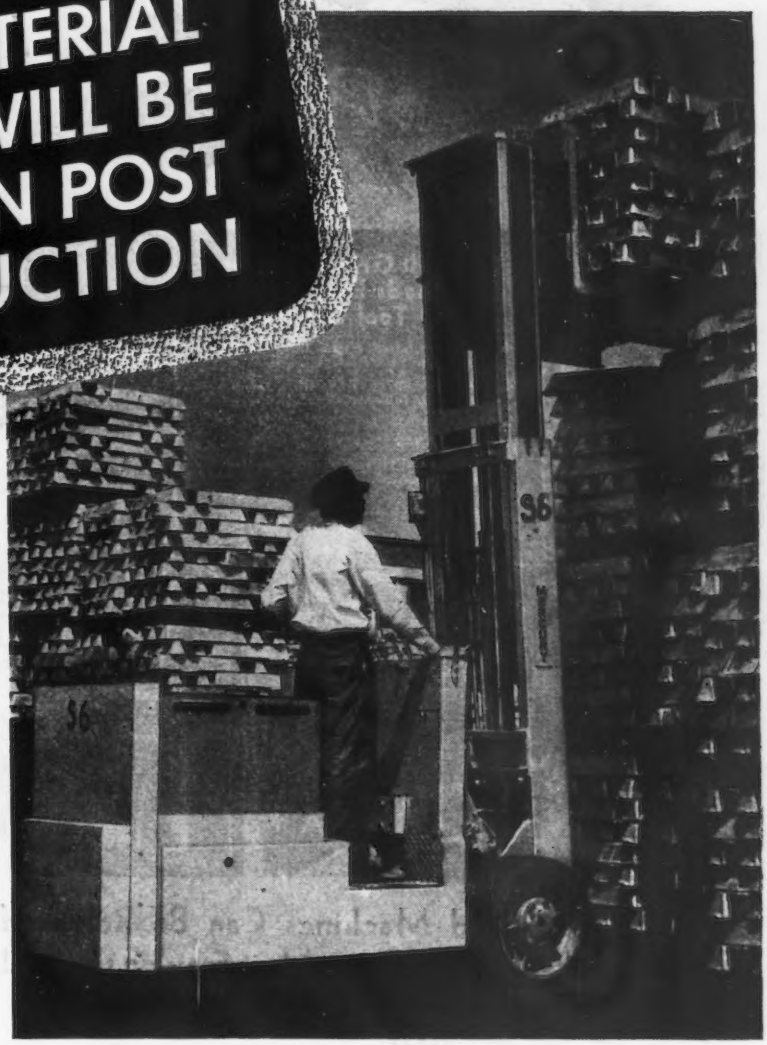
More than a quarter of a million cubic feet of helium gas is used each month for arc welding and other commercial uses and experimental work now under way in the laboratories of the Bureau of Mines and industrial establishments gives promise of its further usefulness in welding and metallurgical processes.

Manpower Supply Up Slightly at Cincinnati

Cincinnati

• • • **The district of machinery** market is without interesting new features. The available manpower has increased under pressure of the labor draft bill in Congress. Skilled men however, continue to be obtained in frequently, but the gain in number of men employed is slightly greater than the loss. Factory forces, nevertheless are still not adequate to push production to theoretical capacity. Present operations are at or very near the capacity of present facilities with most plants running seven days. New business continues to be adequate but only swells present backlogs.

EFFICIENT MATERIAL HANDLING WILL BE IMPERATIVE IN POST WAR PRODUCTION



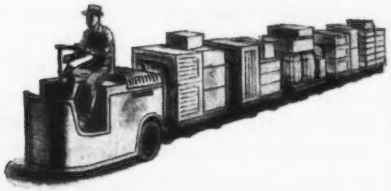
. . . let MERCURY help you plan your system NOW

Indications are that keen competition in the post war market will force prices down . . . this in spite of increased labor and materials costs.

One important opportunity for production economy is in material handling. Experience has proved that efficient handling can reduce finished costs as much as 10 to 20%.

Mercury can help you plan an efficient handling system. As pioneer builders of material handling equipment Mercury has the experience and the engineering "Know How" to analyze your specific problems and to recommend solutions. For example, here is the background Mercury has to offer you:

1. Originators of the "Trackless Train" system of materials handling. The fact that thousands of Mercury tractors and many times that number of Mercury trailers are serving throughout industry is evidence of the popularity of the "Trackless Train" system.



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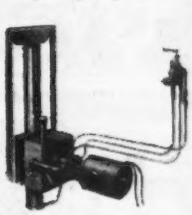
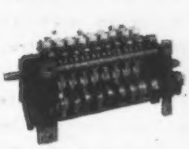
2. Mercury has pioneered and perfected many important industrial truck features. Those illustrated are standard on all Mercury fork trucks. While these features vary slightly on Mercury platform trucks, the basic principles are the same—



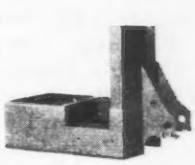
Hydraulic Hoist: No power required to lower load, no power wasted in lifting. Less than 50% of the usual moving parts.

Snap-action cam operated controller: Eliminates injurious arcing. Reduces maintenance to the minimum.



Unit constructed drive assembly: Motor and drive are one unit. Double reduction spiral bevel and spur gears transmit maximum power.

All welded frame: No rivets to weaken sections. Exterior is smooth and pleasing in appearance.



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NEWS OF INDUSTRY

Labor Supply Drops From Wartime Peak

New York

• • • The number of persons available for employment in the United States declined from a record high figure of 66,900,000 in July last year to 63,200,000 in December, according to the Alexander Hamilton Institute. This reduction in the supply of labor was due to such factors as students returning to school and to women returning to household duties. Meanwhile, the number of persons in the armed forces showed an upward tendency, rising from 11,300,000 in July to 11,900,000 in December.

Consequently, the supply of civilian labor dropped from 55,000,000 persons in July to 51,300,000 in December. Although unemployment, which was primarily the result of persons being temporarily idle while shifting from one job to another, was reduced to a minimum, the number of persons actually available for employment in December was 700,000 smaller than the supply.

The number of civilians employed in December thus totaled 50,600,000 as compared with the wartime peak of 54,700,000 in July, 1943, a decrease of 4,100,000. Consequently, the year 1944 ended with the labor shortage particularly acute and with little prospect of alleviation as long as the war continues.

Jet-Propulsion System Discussed in New Book

New York

• • • Aerosphere, Inc., New York, has announced publication of its greatly enlarged, third edition of *Gas Turbines and Jet Propulsion for Aircraft* by G. Geoffrey Smith, M.B.E., internationally known British aeronautical authority.

Extended to 15 chapters, the new volume presents the complete history, with detailed drawings, of every known jet-propulsion system throughout the world.

Added are the very latest developments in adapting the revolutionary gas turbine to both military and commercial aircraft, as well as a discussion of the possibilities presented by its installation in future air transports in combination with both jet-propulsion and newly developed propellers, designed especially for high speeds at high altitudes.

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U. S. and Canada Agree on Disposal Plan for Plants

Washington

• • • Means of disposing of defense facilities built in Canada by the United States have been agreed upon by the two governments. Both have accepted a recommendation of the Permanent Joint Board on Defense the War Department has announced.

Divided in two classes, immovables and movables, defense facilities of the former type which the Canadian government wants to bring under the agreement will be listed within three months of the effective date of the agreement. Each government will appoint a qualified appraiser and the two will agree on the "fair market value" of each facility "at the time and place of appraisal." If the two appraisers cannot agree, they will select a third appraiser to determine the value.

The price established by the appraisers will be paid to the United States government by the Canadian government. It is provided, however, that where the retention or disposal of a facility would result in the assumption of costs by the Canadian government, such as charges for Custody or Demolition, these will be taken into consideration in the final accounting. Existing facilities not listed by the United States government would within one year after the cessation of hostilities be relinquished, without cost, to the Crown either in the right of Canada or in the right of the province in which they lie, as may be appropriate under Canadian law.

The appraiser appointed by the Canadian government under the agreement will be War Assets Corp., which will take custody of the facilities or arrange for their custody by a Department of government or other reliable agency and finally dispose of them.

In respect to general disposal policies the corporation will be guided by the Crown Assets Allocation Committee which will prepare recommendations regarding allocation and the general policy to be followed, these recommendations will be referred to the government where necessary and transmitted to War Assets Corp. for execution. Inquiries should be addressed to War Assets Corp.

Regarding movables, the United States government will remove from

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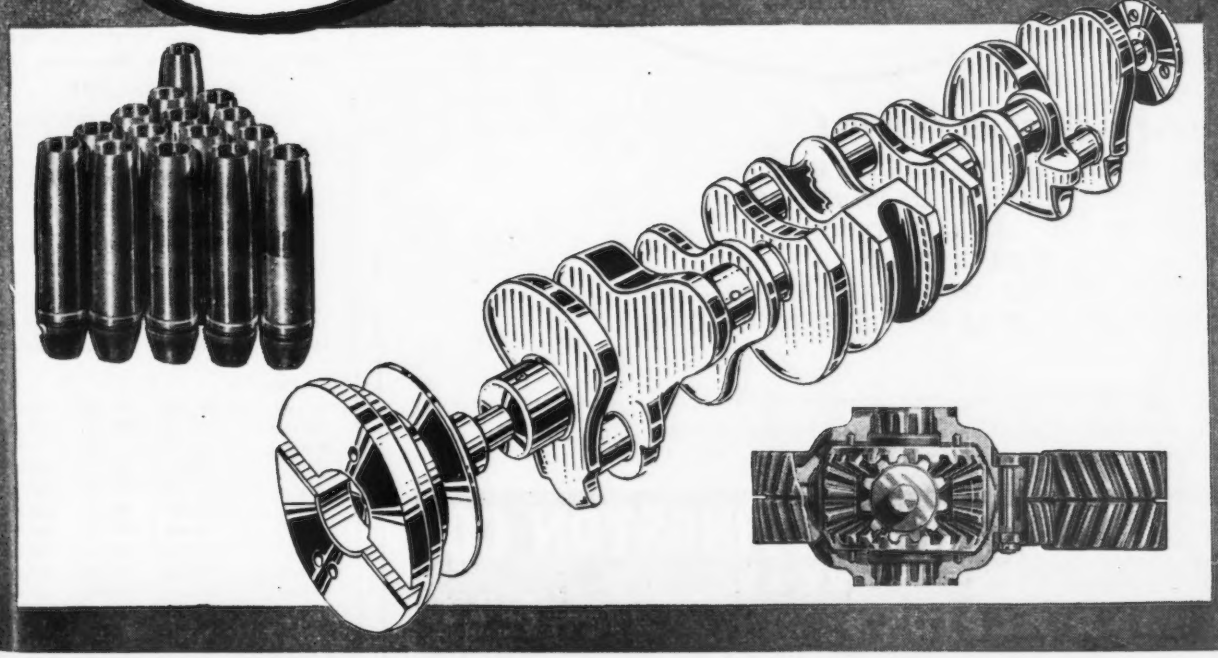

Canada all of them which it desires. The Canadian government will then arrange to purchase from the United States such remaining articles as it desires for its own use or disposition. All movables which still remain will be transferred to "a designated agency of the Canadian government" and will be sold or disposed of by that agency. The proceeds less cost will be paid to the United States government. The United States Government will be represented by a designated officer with an equal voice in all details of the sale or disposal such as the setting of prices, the allocation of priorities and assessment of sales costs. Movables remaining unsold at the end of two years after they are transferred to the Canadian government agency shall either be declared of no value and the account closed or at the option of the United States shall be removed from Canada.

As in the case of immovables, War Assets Corp. acting with the Crown Assets Allocation Committee will handle the disposal of movables for the Canadian government. Outright purchases will be made only for government Departments or Organizations and individuals immediately associated with them in the furthering of the war effort. It is not the intention of the government to make direct purchases for any purpose unassociated with the war effort. The United States officer associated with the disposal of movables will represent his government in assuring that the most favorable sale conditions are obtained.

Shipments of Steel Forgings, by Grade of Steel, by Month, November, 1943 —November, 1944

Source: WPB Steel Division

Month and Year	GRADE—NET TONS		
	Total	Carbon	Alloy
1943			
November	365,463	178,125	187,338
December	366,918	197,560	169,358
1944			
January	354,697	187,900	166,797
February	349,637	183,690	165,947
March	370,424	194,353	176,071
April	347,121	185,011	162,110
May	329,611	177,102	152,509
June	358,526	199,683	158,843
July	314,656	177,289	137,367
August	341,406	195,100	146,306
September	335,628	199,184	136,444
October	347,621	206,688	140,933
November	360,099	217,803	142,296

Cites Successes Of Powder Metallurgy In War Production

New York

• • • "The use of special powder metal products has been very large and essential to the success of the war production program," Gregory J. Comstock, Professor of Powder Metallurgy and Director of the Powder Metallurgy Laboratory at Stevens Institute of Technology, told a recent meeting of the Metropolitan Section of the American Society of Mechanical Engineers.

In a general discussion on the commercial aspects of applied powder metallurgy, with special emphasis on its use in production of war materials, Professor Comstock said that the employment of the metal powder products, such as the hard cemented carbides, in the machining of war materials, had speeded machining operations to a greater extent than any other single factor. Production of these hard cemented carbides has increased five or six fold since the war began, Professor Comstock stated. Molding of metal powder parts as a means of eliminating machining operations, however, has not been applied generally to large war production.

Discussing the wide use of metal powder products in the war program, Professor Comstock said, "Metal powder friction materials, for instance, clutch facings and the like, are very

Steel Castings for Sale and for Own use: Shipments, by Grade, by Month, October, 1943—October, 1944

Source: WPB Steel Division

Month and Year	GRADE—NET TONS		
	Total	Carbon	Alloy
1943			
October	198,753	149,393	49,360
November	202,490	147,173	55,317
December	213,602	162,441	51,161
1944			
January	237,570	180,316	57,254
February	211,958	158,468	53,490
March	224,913	171,144	53,769
April	204,279	154,418	49,861
May	210,360	158,873	51,487
June	200,237	153,500	46,737
July	176,735	134,064	42,671
August	204,833	153,302	51,531
September	189,443	140,517	48,926
October	197,772	142,458	55,314

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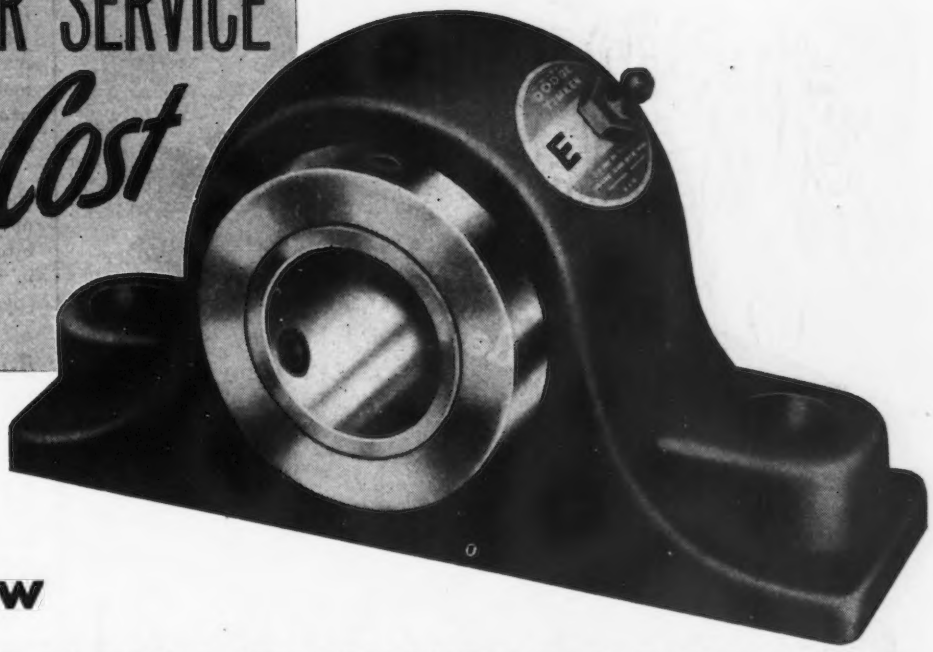

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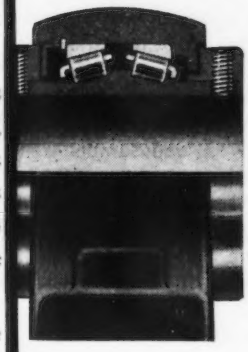

Genuine Timken tapered roller bearings handle any combination of radial and thrust loads in normal installations.

Extra long inner race distributes the load.

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Simplified labyrinth seals protect against dust, dirt and loss of lubricant.

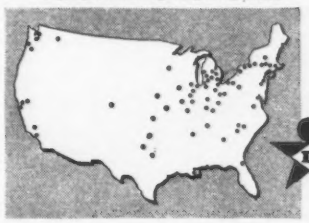
Factory assembled, adjusted, lubricated, ready to install.

TRANSMISSIONEERING achieves a new combination of high performance with low cost! Type "E" is the lowest priced Timken-Bearing-equipped mount on the market. There is no sacrifice of quality; the low price is the result of Dodge Transmissioneering skill, and efficient, volume production.

Precision-built, rugged, dependable, the new Type "E" bearing assures 30,000 hours or more, of service, under conditions for which it is adapted. It offers superior load carrying and high speed capacity.

Type "E" bearings, completely assembled, lubricated and adjusted at factory, ready for immediate use, are available in Dodge distributors' stocks. Call the Dodge Transmissioneer in your territory for information about these, *and other new developments in power transmission equipment,* to help you increase production efficiency and lower your power costs.

DODGE MANUFACTURING CORPORATION
MISHAWAKA • INDIANA



There are 210 Dodge factory graduate Transmissioneers, located in principal cities, to show you new and better ways of transmitting power.

Sign of the Dodge Transmissioneer

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DODGE ROLLING BEARINGS . . . THE 30,000 HOUR LINE

TRANSMISSIONEERED MEANS ADVANCED DESIGN IN POWER DRIVES

generally employed in all milita equipment whenever they are a plicable because they give better se vice. Such other products as conta materials, electrode materials, poro metal powder bearings and tungst products have been very largely a plied for war emergency use.

"Ferrous powder metallurgy a the development of iron and ste molded products is one of the mo interesting possibilities now present in the powder metallurgy field," t speaker added.

By-Product Coke Makers Form New Institut

Washington

• • • The American By-Product Co Institute has been formed under t General Not For Profit Corporati Act of Illinois. Officers of the Institu are as follows:

President: Leigh Willard, presider Interlake Iron Corp., Cleveland; Vic President: William H. Earle, pres dent, Philadelphia Coke Co., Phil delphia; Treasurer: P. H. Neal, ma ager, Coke & By-Product Sales, Al bama By-Products Corp., Birmingha Ala.; Secretary: Alfred Hirsh, vic president, The Laclede Gas Light C St. Louis.

Headquarters will be established Washington, D. C., and Samuel Wei who has recently resigned as Chief Fuel Section, Steel Division, War Pr duction Board and Chief of Coke D tribution of the Solid Fuels Admin tration for War, will be the executi secretary.

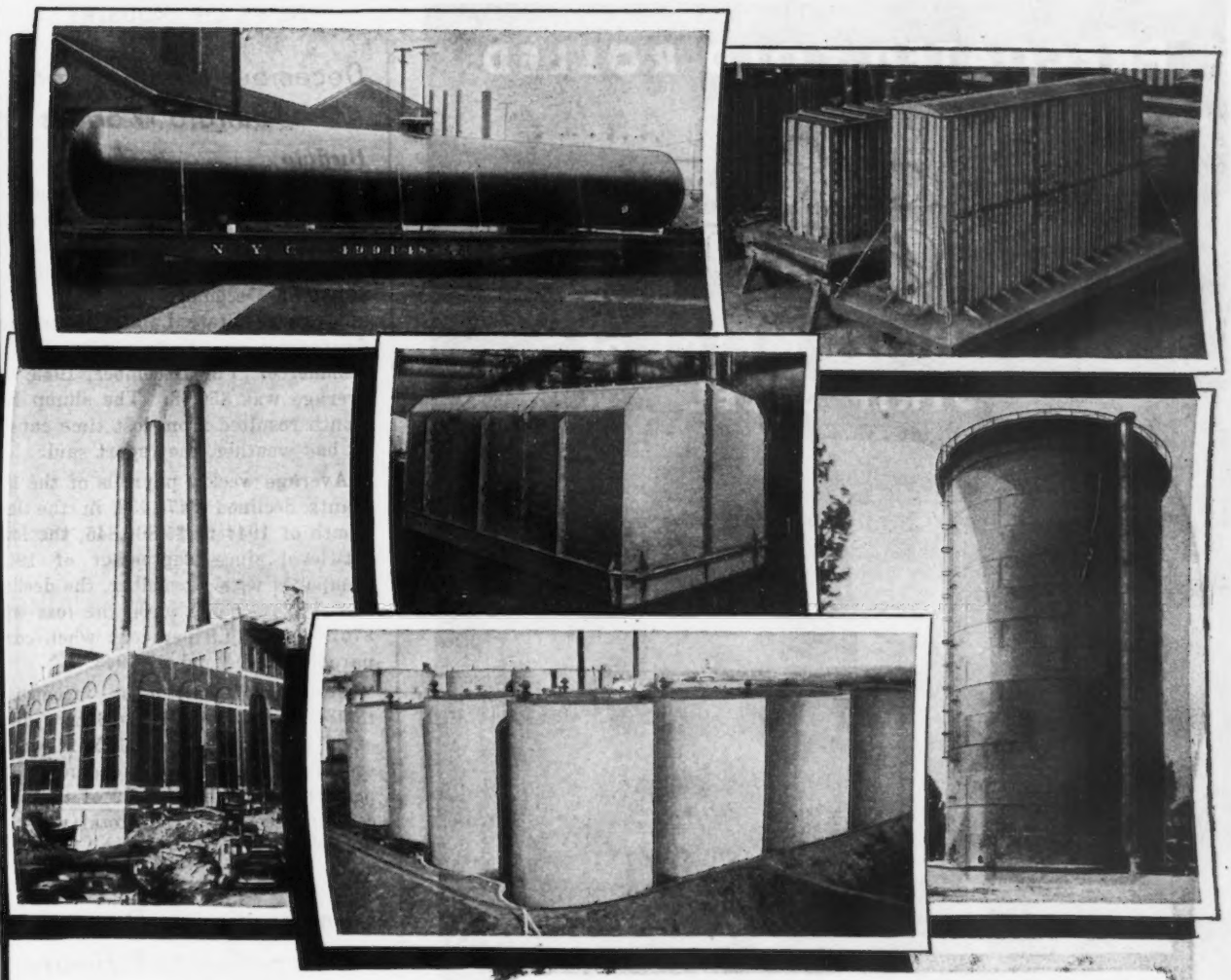
Curtiss Wright Ups Output

Buffalo

• • • Curtiss-Wright Corp., airpla division plants at Buffalo establish a new month record for production C-46 Commando cargo planes for t armed forces in January, when t output was 13 per cent above the b previous total.

"January production and schedul output for February definitely w wipe out all of the production l during December, when plants we closed 10 days for necessary inve tory work," the company announc

The January record of the Buff plants, "accomplished in spite of a verse weather conditions," was one the outstanding achievements in t district, according to Col. Kenn Collins, commanding officer, easte district, Air Technical Service Co mand.



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eneral American, with its Plate and Welding ivision plants at Sharon, Pa., has for years ecialized in the manufacture of a long line products for the iron and steel industry, ch as:

Accumulators	Welded Pipe, large dia.
Annealing Covers	Pressure Vessels
Galvanizing Pots	Pickling Tanks
Tin Pots	Standpipes
Stacks	Towers
Acid Tanks	Coke and Benzol Plant Eqpt.
Bins	Welded or riveted plate fabrication, shop built-up or field-erected
Oil Storage Tanks	
Gas Mains	

cause of our complete manufacturing facil-es, including X-ray, heat-treating and stress-lieving furnaces, and a thoroughly-equipped organization for field erection—plus "know-how" based on successful achievement in many large and important projects—General American is ready, willing and able to handle practically any job you have in mind. *Write* for any specific facts you may need.

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December Earnings For Buffalo Workers Of

Buffalo

• • • **Average weekly earnings** o workers in 173 plants of the Buffal district dropped from the record hig of $55.08 established in November t $51.19 in December, according to a analysis of State Labor Departmen figures by the Buffalo Chamber o Commerce. For December, 1943, th average was $50.58. The slump las month resulted from lost time cause by bad weather, the report said.

Average weekly payrolls of the 17 plants declined $474,432 in the las month of 1944 to $5,866,845, the low est level since September of 1942 Compared with November, the declin was 7.5 per cent, while the loss wa $761,481 or 11.5 per cent when com pared with December, 1943.

December employment, accordin to the chamber, was 114,608, a dro of 0.5 per cent from the 115,121 work ers in November and a decline of 1 per cent from the 131,049 of the pre ceding December. The total was th lowest since June, 1942.

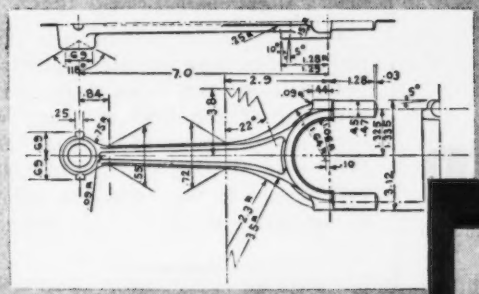
Construction to Drop According to Estimate For Year 1945 by WP

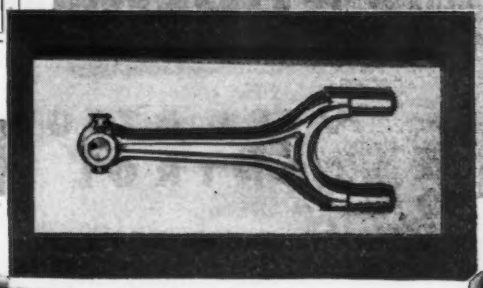
Washington

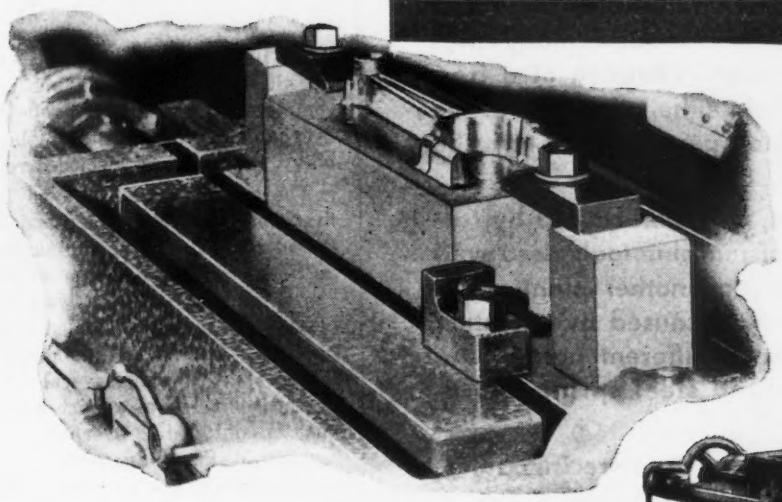
• • • **The lowest since** 1935, WP preliminary estimate places 1945 ne construction volume at $3,250,000,00 assuming that war on both fronts wi continue throughout the year. This i 82 per cent of the 1944 volume and 2 per cent of the 1942 peak perform ance. Almost half of the 1945 volum it was stated, will be accounted for b privately-financed work as contraste with 40 per cent in 1942 and 20 pe cent in 1943. Construction activit generated by purely military require ments is expected to be about one third less in 1945 than in 1944, bot for industrial and non-industrial work

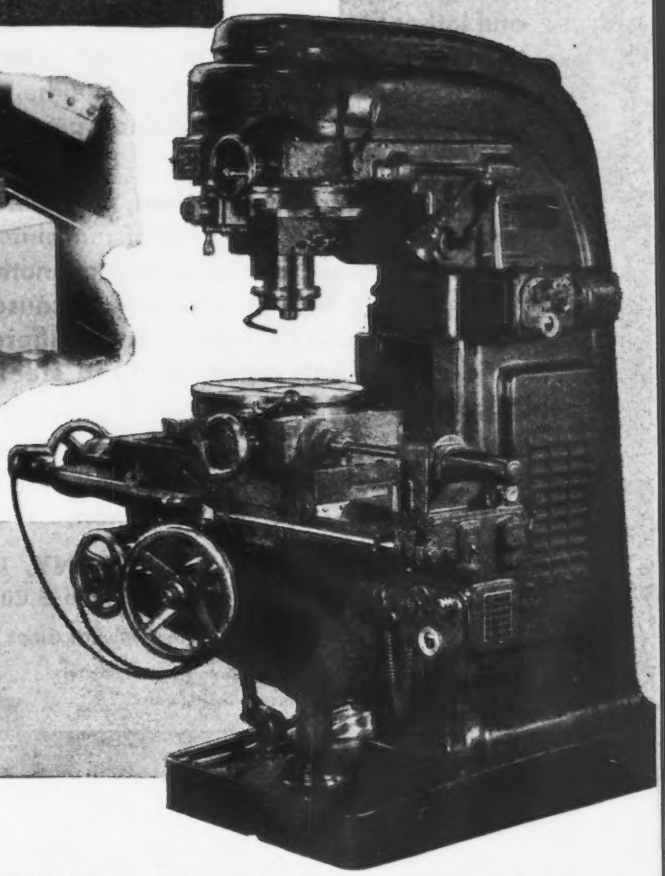
Military construction within th United States is expected to declin from $730,000,000 to $480,000,000 an Government-financed factory construc tion from $745,000,000 to $470,000,00 Privately-financed factory construc tion in 1945 is estimated at $250,000 000, a 7 per cent increase over 194 Over-all housing volume is expecte to decline from $690,000,000 to $500 000,000 or 28 per cent under 194 with the bulk of the decrease occu ring in government-financed work. A

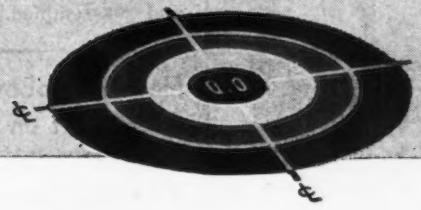
How Many Hours Would You Need to Mill this Master Hob?











Speed, economy and accuracy are typical performance features of a Milwaukee Rotary Head Milling Machine. The milling operation on this master hob is an excellent example. *Read this job report —*

MASTER HOB—MATERIAL—High Carbon—High Chrome Steel. TIME DISTRIBUTION—Set-up, ¾; Layout, 1¼; Rough Mill Complete, 10; Finish Mill Complete, 29. A total time of 41 hours.

Check these advantages of the Milwaukee Rotary Head Milling Machine and how you can benefit from them in your own shop:

DIRECT . . . mills mold cavities in a single set-up without the aid of templets or models.

ACCURATE . . . chances for error are eliminated because there is no change in set-up. Exact control of all combinations of cutting movements — possible only with this machine — transmits mathematical precision to the work.

FAST . . . initial job preparation and set-up time is reduced to the minimum. Accurate performance of the machine saves operator's time and rapid production of intricate molds and dies is the result.

Write for Bulletin No. 1002C and complete information.

BUILDERS OF MILWAUKEE ROTARY HEAD MILLING MACHINE • MIDGETMILL • SPEEDMILL • FACE MILL GRINDER • AUTOMETRIC JIG BORER • CENTER SCOPE.

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other types of non-industrial construction are expected to total $1,550,000,000, a slight increase over 1944.

Deliveries of processing machinery and equipment to industrial plants in 1945 will be down to an estimated 75 per cent of the 1944 rate and will have a total value of $1,150,000,000, WPB said. Of this amount, $650,000,000 represents the estimated volume of deliveries to Government-financed plants.

Sub Base Is Described As Completely Set Up For Rebuilding Craft

New York

• • • **Bethlehem Steel Co.** has built a fully-equipped submarine base to completely recondition, repair and overhaul undersea boats of the U. S. Navy, the company disclosed recently.

The company made known for the first time, with Navy permission, that it had constructed the submarine base as a new addition to one of its ship repair yards. Location was not disclosed but it was revealed that the base can handle a number of submarines at a time, several of them in drydock. It was reported that the base is equipped to overhaul the submarines dismantling their equipment and machinery and completely rebuilding them. Everything in the hull is removed, piece by piece.

"The 65,000 pieces of material are carefully cleaned, checked over, repaired or replaced where necessary, and reassembled."

Hewitt Rubber Cutting Third Shift on Fuel Cells

Buffalo

• • • **The Hewitt Rubber Co.'s** Niagara Street plant will eliminate the third shift after Feb. 5, because of a change in military requirements, according to President Thomas Robins, Jr. More than half of the employees affected will be retained to fill vacancies on the first and second shifts and others will be transferred to the Main Plant in Kensington Avenue.

The entire facilities of the Niagara Street plant have been devoted to production of "bullet-sealing" fuel tanks, it was explained, but present schedules of the armed forces call for a greater proportion of big cargo planes, most of which are not equipped with the "self-sealing" tanks.

Diesel Development May Mean Reduction Of Fuel Shortages

Mount Vernon, Ohio

• • • A new development in the Diesel engine field, which will enable the engine operator to use either gas or oil as fuel without an electrical sparking device, and which is reported to cut fuel consumption of gas engines by from 20 to 25 per cent, was revealed here recently by Ralph L. Boyer, chief engineer, Cooper-Bessemer Corp., Diesel manufacturers.

Mr. Boyer states that the discovery is the result of experimentation which began in 1928. Recently efforts have been rewarded by the successful operation of a natural gas engine on the Diesel principle. This enables the unit to operate on a wide variety of fuels including fuel oil, natural gas, manufactured and coke oven gases, sewage gas, and refinery by-products.

The conversion from liquid to gas fuel is as simple as the closing of one valve and the opening of another with the engine operating continuously at full load, Mr. Boyer said. Although conversion from one fuel to another has been possible in the past, it has always been necessary to shut down and exchange major or minor parts of the engine.

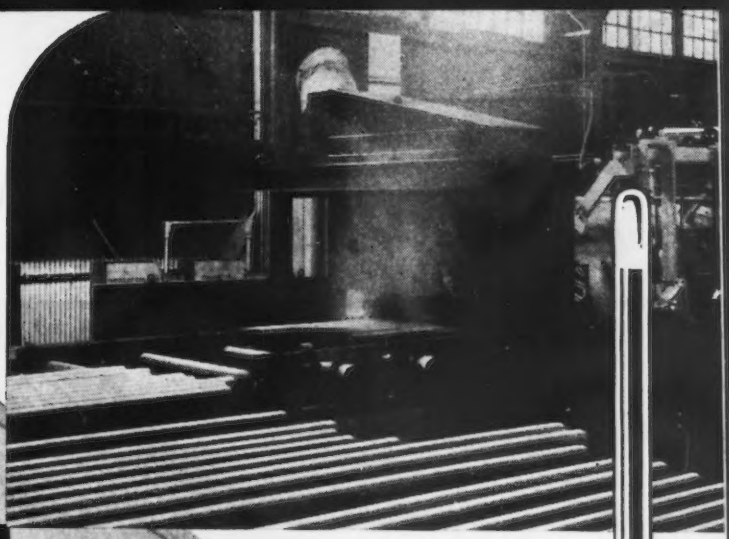
The new principle will enable the engine to have the same fuel economy regardless of the type of fuel used. It raises the normal 25 per cent thermo-efficiency of the gas engine to the 35 per cent thermo-efficiency common in Diesel oil engines.

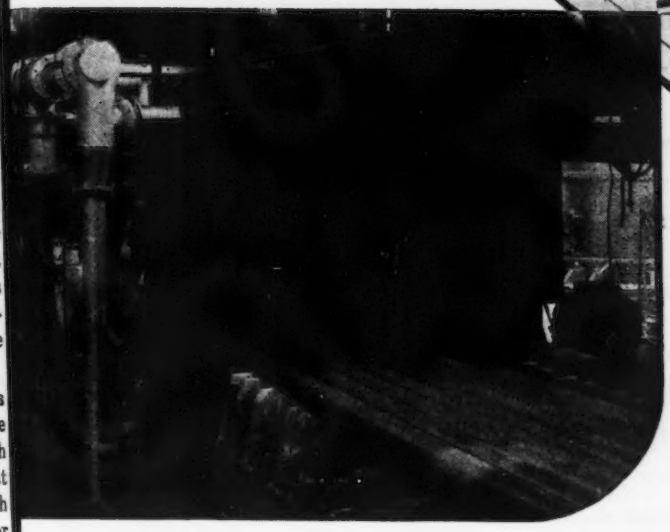
Several times since 1928, Mr. Boyer said, engineers in the Diesel field thought they had the answer to the multi-fuel conversion problem but in the past it has been thought necessary to inject the gas under high pressure of from 1200 to 1500 pounds. This involved complications which overcame the advantages obtained. The Cooper-Bessemer development makes possible the use of gas at normal pressure.

The significance of the new discovery is particularly impressive when one of our modern transcontinental pipe lines is considered. Many of these pipe lines have from 100,000 to 150,000 horsepower of gas engines installed along their length which drive the compressors or pumps that deliver the fuel to the markets of the East. The total fuel used by these engines would amount to 36,000,000 cu. ft. of gas per day, which is about one-third of a

SALEM'S

Engineered Heat





APPLIED TO TUBULAR PRODUCTS

★

THE REQUIREMENTS—A furnace for draw tempering and normalizing steel pipe, 2 to 14″ in diameter.

THE DESIGN—Horizontal cylindrical type—100′ plus in length.

THE FEATURES—Roller driven hearth; burners firing tangentially into the chamber, providing a rapid, swirling action; two 100′ roller tables at either end; five automatic recording temperature zones in the heating chamber; a rayotube instrument which continuously charts the temperature of all tubes being discharged; two-man operation.

RESULTS—Furnace changes from draw temperature to normalizing temperature in one hour and reverses the change, high to low, in two hours. When normalizing, the furnace heats about 20 tons of pipe in one hour and 18 tons when only draw tempering is required.

Salem combines engineering with economics in designing furnaces to suit specific heat treating requirements. We call this service—

SALEM'S Engineered Heat

NOTE—War production has spurred many sensational developments in heat treating, particularly in controls, quenching and fitting the parts to the method. Salem engineers will be glad to discuss these advances with you.

SALEM **SALEM** OHIO

ENGINEERING CO.

SALEM ENGINEERING COMPANY

day's consumption of a city of a million population.

When operating as gas engines, these new gas Diesels would save from 5,000,000 to 6,000,000 cu. ft. of gas for domestic and industrial consumption per day. If these engines are converted to oil fuel, and they could be in a moment's notice, to any or all oil fuels, the total fuel consumption of 36,000,000 cu. ft. of gas could be made available for consumer use.

If this new principle had been discovered some time prior to the present gas shortage, the curtailment of war production such as has been in existence in recent weeks might have been avoided.

The Cooper-Bessemer Corp. already has engines embodying the new principle in production along with their standard line.

In addition to the convertibility feature and the possible fuel saving, the new discovery in Diesel operation will mean the elimination of one of the fire hazards in the gasoline refining industry because there will be no necessity for using any ignition or sparking device.

Mortar Demand Increases

Washington

• • • **The December mortar** and medium ammunition program will involve some 5000 or 6000 new machine tools in addition to compressors, pumps, conveying systems, paint spray equipment and other requirements, all of which will call for considerable quantities of electric motors and controls, it was pointed out at a recent meeting of the WPB Integral Horsepower Electric Motor Industrial Committee. These and other requirements were discussed in connection with the integral horsepower electric motor needs, which, the committee said, will be as critical during the next six to nine months as any period in the last two years.

In the last six weeks several top urgency programs involving considerable quantities of electric equipment have been initiated or expanded and equipment for these programs will be needed, WPB said, within the next three to nine months. Substantial quantities of equipment are being requested for delivery as early as April for orders that are just now being placed. It was stated that close cooperation between WPB, the various claimant agencies and members of the industry is necessary to get requirements for these programs.

AMERICA'S OLDEST, LARGEST, AND ONLY CRANE BUILDER PRODUCING COMPLETE ELECTRICAL CRANE EQUIPMENT

WAR TAUGHT US THIS LESSON ...FOR PEACE

"Now we know how much depends on swift and steady handling of materials — how it made a reality of otherwise impossible war production schedules. A lesson to remember for peacetime — when mass production to create maximum employment must be maintained — to rebuild America's living standards. It goes without saying — that the smooth, dependable load-handling service of modern P&H overhead cranes — installed *now* where needed — will speed winning the war as well as the peace."

* * * *

In your plans for any overhead materials handling installations, consulting with P&H — America's *oldest, largest, and only* crane builder producing complete electrical equipment — assures you of sound experience as well as sound value.

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Soil Pipe Labor Asks Assistance In Upping Output

Washington

• • • Made up of representatives of the AFL and CIO, the Cast Iron Soil Pipe Labor Advisory Committee, at a recent meeting with WPB officials, recommended for the purpose of increasing production of soil pipe that: Better plant facilities should be provided.

Labor-management Committees should be provided.

Increased wages should be provided.

OPA should be enabled to raise the ceiling price so as to enable manufacturers to grant wage increases and improve working conditions.

The industry should get higher manpower priority ratings from WMC.

The commitee recommendation for better plant facilities related especially to "proper ventilation, fans, proper heating, washrooms, sanitary toilets, lockers for clothes and space for workers to eat their lunch."

In recommending increased wages, the committee said the average wage is not a "living wage." The committee recommended specifically that the piece-rate molder and dry sand core workers should be guaranteed an hourly wage equivalent to the hourly rate for that work in the industry; that there should be a reclassification of workers to create a category midway between common labor and skilled workers; and that this semi-skilled category should include chippers, grinders, millroom men, cupolo crews, sand blasters, core carriers and shakers.

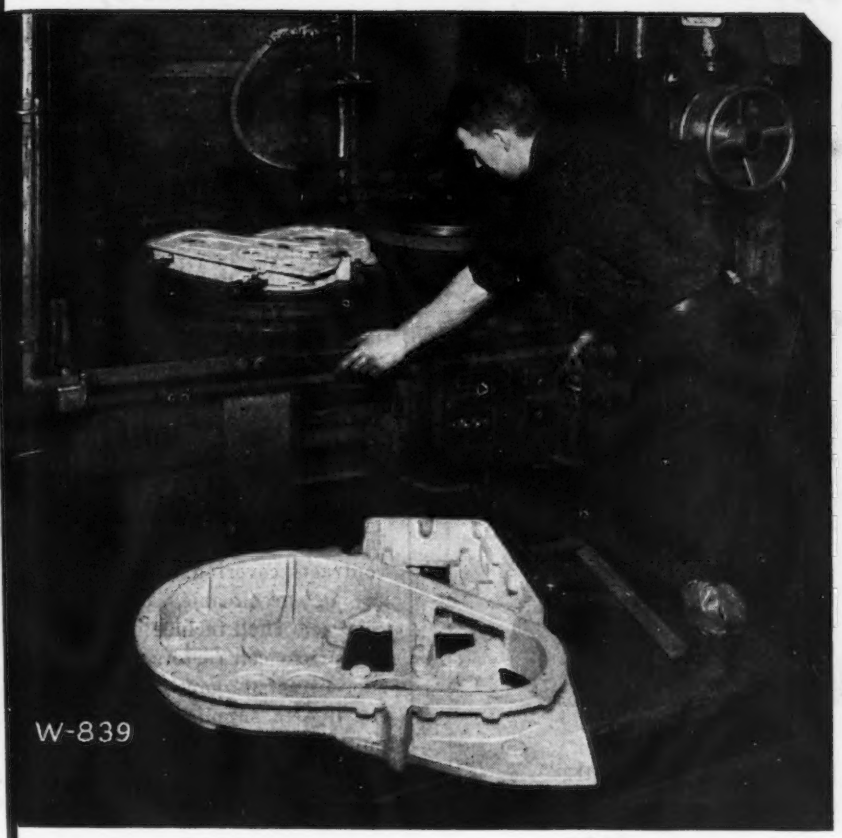
Scarff Gets Promotion In AAF Procurement Position

Dayton, Ohio

• • • Promotion of James G. Scarff, formerly vice-president of Harriman Ripley and Co., of New York, to the grade of colonel was announced here recently by Brigadier General Orval R. Cook, chief of the Procurement Division, Air Technical Service Command.

Colonel Scarff is procurement executive in the division's production section. Colonel Scarff is responsible for the procurement division's purchasing activities, in which he negotiates contracts representing several billion dollars a year.

"Put it on the Blanchard"



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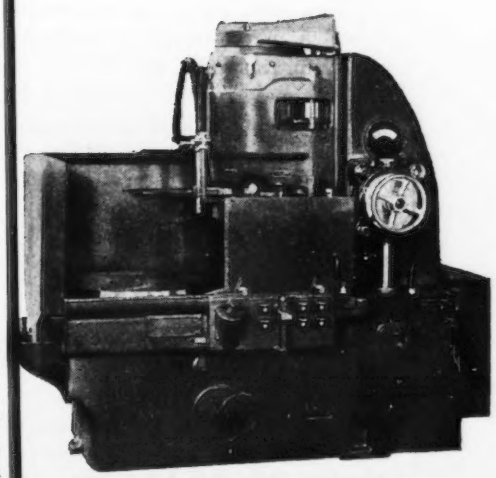
✓ **Production**
Adaptability
✓ **Fixture Saving**
Operation Saving
Material Saving
Fine Finish
✓ **Flatness**
Close Limits

Grinding Aluminum Mounting Plates

Here is another good example of a large but frail piece done on the No. 18 Blanchard Surface Grinder.

These 23½" x 22" aluminum mounting plates are lightly clamped to a steel base plate on the magnetic chuck. Two pieces (4 surfaces) are ground per hour, removing 5/32" from each surface.

When surfaces must be flat and parallel, "put it on the Blanchard".



No. 18 BLANCHARD SURFACE GRINDER

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The BLANCHARD MACHINE COMPANY

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Contract Delays Recognized by WPB As Factor in Wa

Washington

• • • **Delays in placing** both prim and subcontracts have been recognize by government officials as an impo tant cause of delays in war produ tion, and orders have been issued contracting officers to expedite co tract placing for the 1945 munitio program, according to an announc ment by WPB Chairman J. A. Kru Under the new policy it is hoped th production delays caused by t shortage of components vital to fin assembly of many war items will eliminated.

Orders issued state that contrac ing officers must place promptly the contracts covering expected needs far as practicable, and that the contracts shall include clauses requi ing prime contractors to place the subcontracts promptly, and so on dow the line to suppliers of the smalle units.

Mr. Krug explained that if t "buying cycle" of the armed servic is kept short, it is often impossib for prime contractors to place orde with their subcontractors and for su contractors in turn to place the orders with their own suppliers ear enough to make certain that mate als and components are received time. A manufacturer of compone parts, for instance, Mr. Krug poin ed out, may readily produce ahe of his contract if he feels reasonab sure that the items he is making w be called for in the future; but if t future demand for the products b comes too much of a gamble, he apt to draw on his inventories inste of keeping his production rates u so that his actual production of par will not keep pace with the requir production of the finished items in which those parts are going.

Of necessity, material and comp nent manufacturers must assume co siderable risk, Mr. Krug said. Th was said to be inevitable from t very nature of the business and t rapid changes in the needs of the wa The government should, however, said, place orders as far in advan as it can anticipate its firm needs a require its prime contractors to pla the orders with their own subcontra tors as quickly as possible.

Soviet Foreign Trade System Operation Is Outlined by Official

New York

• • • **Practical methods for** the organization of American-Soviet postwar trade are set forth in *Soviet Russia Today*, an article by Valery J. Tereshtenko. The author, who is Principal Area Analyst of the Eastern European Branch of United Nations Rehabilitaton Relief Administration, sees sound commercial relations with the USSR as an essential factor both for America's welfare and international security.

Mr. Tereshtenko states that in his opinion it is a truism that a comprehensive international trade policy, suited to the needs and conditions of the postwar world, is an integral part of the whole system of international economic and security relationships toward which all Allied nations are now working. In turn, eventual trade relations with the Soviet Union constitute a factor which cannot be overlooked in shaping any comprehensive postwar policy of international trade.

Foreign trade in the USSR is a monopoly of the State. Many changes have been made in the organization of Soviet foreign trade since the time of the issuance of the decree of April 22, 1918, when nationalization was first effected. The fundamental principles, however, remain at present the same as they were 26 years ago. More than that, the Soviet method of selling and buying abroad, worked out after years of trial and error, proved to be so satisfactory to Russians that there is no justification whatsoever for thinking that any basic changes in it may take place after the war, although some further technical improvements might be made.

According to this system the administration of foreign trade is vested in the All-Union People's Commissariat of Foreign Trade. In collaboration with appropriate planning and financial agencies, the Commissariat of Foreign Trade prepares an export-import plan, directs the execution of this plan, and manages the customs. The so-called combines, or export and import corporations, constitute a network of operating organs of the Commissariat of Foreign Trade. Each of these combines deals with a specific line of commodities, according to Mr. Tereshtenko.

On the basis of the goods available for export, the combines make and

place orders either directly or through the Torgpreds (trade delegations abroad). In the case of imports, the respective organizations submit statements of their requirements from foreign countries, within the limits of their annual plan, to the relevant importing organizations. The latter present their summary requirements to the Commissariat of Foreign Trade. After the necessary approval has been secured, the importing organizations issue separate licenses for specific purchases abroad.

On the basis of estimates submitted by various institutions concerned with foreign trade, the planning section of the Commissariat of Foreign Trade compiles a general yearly plan of the export-import trade and submits it to the State Planning Commission where the plan is considered in conjunction with the views of other Commissariats. The above Planning Section prepares also quarterly plans of marketing and shipment of goods to and from foreign countries. Such plans are adjusted to general conditions on the world market.

The UNRRA executive states that, "In the case of the United States, the Amtorg Trading Corporation is the center of trade with the Soviet Union. It was organized in New York City in 1924 and is manned by American and Soviet technical personnel. The peak for exports which passed through the channels of Amtorg was reached in 1930 when the total value of the American exports to Russia was $113,400,000. More than 200 various commodities were imported by this country during the period from 1925 to 1941, the maximum in imports having been reached in 1937 ($27,200,000)."

The "philosophy" behind the Soviet system of foreign trade is rather simple: It makes foreign trade an integral part of the Russian planned economy and establishes a close connection between export and import operations. Such integration of foreign trade with the economic life of the country gives the USSR a mighty economic weapon to strengthen both her internal economic system and her international position.

Undoubtedly, the Soviet system of foreign trade differs greatly from that prevailing in the rest of the world. However, it provides a number of advantages for those who trade with Russia. They can deal with a buyer and a purchaser whose credit record is unimpaired no case of default in Soviet trade ever having been reported, whose potential mar-

ket as extensive as Russia herself, and whose unlimited natural resources can serve as the best guarantee for payment.

From the practical standpoint the question of financing American-Soviet postwar trade constitutes one of the most important phases of the whole vast problem of economic relations with the Soviet Union. The importance of private credit on the part of American banks should not be by-passed in this case. It is questionable, however, whether private credit can be found available in such amounts that it could become a decisive factor in financing American-Soviet trade.

It would be a rather hazardous undertaking to estimate at present what amount of credit Russia will ask for. If, however, on the one hand, we take into consideration that between $150,000,000,000 to $200,000,000,000 is suggested as the amount of the world's capital needs for the reconstruction and continuance of normal economic activity and that on the other hand Soviet reconstruction needs may largely determine the nature of postwar trade with the Soviet Union, the needed loans to Russia may run into astronomical figures. The handling of such credits will require adequate financial machinery.

In connection with this, the proposed International Bank for Reconstruction and Development may come into the picture of future American-Soviet trade. The plan for such a bank was discussed and agreed upon by representatives of forty-four nations at the United Nations Monetary and Financial Conference which met at Bretton Woods, N. H., from July 1 to 22, 1944.

It is true that technical efficiency and sound business interests should always constitute an integral part of national trade. However, they should not be considered the only decisive factors. There must be adequate room provided for profit making in order to stimulate the export-import transactions of man. Profit making, however, should not be regarded as something which by itself necessarily will bring about the welfare and prosperity of the world. International trade, international peace, and international political cooperation are interlocked. None of them will work alone.

There is nothing unnatural in an individual importer or exporter doing business for the sake of business. International trade as a whole, however, and trade with Russia in particular, must not be visualized as an arithme-

tical total of all export and imp transactions. It must be an integ part of the international econom social and political collaboration rected toward the peace and lasti health of both great nations and world as a whole. Many of the n factors brought by the war will ha to be taken into consideration shaping this policy. One of these f tors is the war contribution of Rus to the cause of the Allied Nations contribution made possible at a t mendous price—through the devasa tion of Russian land and the sufferi of its people.

This does not call necessarily charity. Sound commercial relatio cannot be based on a foundation charity; neither would the natio dignity of the Soviet Union perm charity on a scale commensurate w her war contribution. What will needed are constructive assistan and sympathetic consideration of type illustrated, for instance, by lend-lease arrangement with Russ By helping Russia with lend-le shipments, the U. S. in the fi analysis, is also helping herself.

Perhaps the measures needed organizing trade with Russia—at le for the period immediately follow the end of military operations w not be able to stand the standard co mercial test. And yet, if approach from the angle of a long-range co mercial statesmanship they may "profitable" to this country as w Not only does the S. U. need Ame can goods and commodities, but economic interests of the U. S. ne the Soviet market as well. Last at the conference with Eric A. Joh ton, president of the Chamber Commerce of the United States, M shal Stalin stated: "We can furn any quantity (of raw materials export) you wish, if we can get equ ment to produce it. That is the r son that we are interested in lo term credits. We can get along wi out them but it will be slower."

A long period of reconstructi however, will mean a long period new hardships for the Russian p ple. It will mean the same also the United States, if American dustry which has expanded t mendously during this war, will be prived of the limitless potentialit of the Russian market.

The magnitude of the quanti which this country will need to exp after the war can be illustrated the fact that in order to merely the gap left by lend-lease expo present American exports must

raised from $2,800,000,000 to $14,300,000,000 a year. Among the potential purchasers of this country's export surpluses, the Soviet Union may play an extremely important role.

The problem of future American-Soviet trade is not only a Russian problem, it is a national problem of the United States as well. If so, the solution of the problem of American-Soviet trade should not be reduced to finding a form for from-day-to-day export-import transactions. The solution calls for a long-range policy dominated by the spirit of good will and co-operation.

Russia Receives Over Two Million Tons Of American War Steel

Washington

• • • **From the beginning** of the lend-lease program in October, 1941, through November, 1944, the United States sent 2,120,000 tons of steel to the Soviet Union, as part of the vast shipments made to Russia under that program as revealed by a report made public on Feb. 2 by Foreign Economic Administrator Leo T. Crowley. Of this total 478,000 tons consisted of rails and 110,000 tons of wheels and axles. Also sent to Russia were 16,600 tons of ferroalloys and 733,000 tons of non-ferrous metals, which included 253,000 tons of aluminum, 314,000 tons of brass and 65,000 tons of other copper products. Other shipments included 1045 railroad locomotives, 7164 flat cars, 1000 dump cars and 100 tank cars. For the purpose of helping replace sources of power such as the ruined Dnepprosstroy dam, the United States sent 60 power trains. Up to Dec. 1 of last year, the United States supplied Russia under lend-lease more than 331,000 motor vehicles, including 45,000 jeeps.

The finished munitions sent to the Soviet Union up to Nov. 30, 1944, include: 12,200 airplanes, the largest allocation of planes to any individual nation on our entire lend-lease program; 135,000 machine guns; 294,000 tons of explosives, mainly TNT and powder; 6000 tanks; 1800 self-propelled guns; 1200 half tracks, 13,000 pistols; 3300 armored scout cars; 8200 guns of varied sizes, including anti-aircraft; 5500 artillery prime movers; and 1700 ordnance vehicles.

British Pipeline System Distributes Fuel for Invasion

New York

• • • An important network of oil pipelines were recently disclosed in England where they were developed to unload and distribute the vast supplies of fuel needed for air and ground operations in Europe.

According to a detailed report issued by Geoffrey Lloyd, parliamentary secretary to Britain's Ministry of Fuel and Power, 2,400,000,000 gal. of oil, including millions of gallons of aviation gasoline have been carried to the principal centers of consumption, mainly airfields.

During recent months 5,000,000 gal. of petroleum were carried daily. The pipeline costs about $28,000,000 and 80,000 tons of steel were used in the construction.

One reason for its construction was the great increase in the quantity of oil that had to be transported due to the presence in Great Britain of the U. S. Eighth and Ninth Air Forces. It also facilitates the delivery of the over 383,000 liquid tons of petroleum products which the British War Office handed over to the U. S. Ground Forces, under reverse lend-lease, between Jan. 1 and June 30, 1944.

The first part of the network to be laid down was a line to link the southwest oil ports with the London area. This pipeline was not intended for aviation gas, but it would furnish help by leaving the British railways free to carry the increasing quantities of aviation fuel needed by the RAF. The terminal depot opened on Dec. 5, 1941, six months after the preliminary work on the line had been begun.

The next section of the plan was the linking in of the oil ports of the northwest coast, and this was achieved by a pipeline from this area running southwards to join the first line.

Facilities for pumping in either direction were provided and storage depots were linked into the pipeline. In the event of damage to either West Coast oil terminals, supplies, with an additional line, were available and could be pumped from the north or south, and the eastern area thus provided with two sources of supply, completed on May 30, 1942.

Up to this point, the system had enabled the British railways to deal with the rapidly growing demand by the RAF for aviation fuel, by relieving them of carriage from west to

east of tens of millions of gallons of gasoline and paraffin. But further pipelines were needed to handle the enormous increases in aviation gasoline requirements.

A big bomber offensive was beginning, and to prevent a lack of the octane needed to sustain this offensive, the British Oil Control Board decided upon a new series of pipelines to carry the aviation spirit from West Coast ports to depots within easy reach of the great new airfields.

The plan provided for lines running from the West Coast ports handling incoming tankers. These lines linked up to form an aviation gas circuit over 350 miles in length. In the autumn and winter of 1943, further extensions to the pipeline system in the south and east of England were undertaken, partly to meet special Air Force needs and partly for the Continental requirements of the Allied armies. The shortest of these extension lines runs for 22 miles and the longest for about 120. Another is nearly 100 miles in length, and all were in operation by the middle of March, 1944.

With the enormous demand for steel for all war purposes, speed of laying was limited by deliveries of pipe from the mills. More than half the system consists of 8-in. pipe and more than a quarter of 10 in. The short stretches of spurs consist of 12, 8 or 4-in. pipe. Practically all the pipelines are designed to work at a pressure of 600 lb. per sq. in. The pressure enabled the comparatively light steel pipe to be used, and thus large quantities of steel were saved.

In normal construction, every joint in the pipeline is "butt welded." Britain's pipeline system had to be built without welders, as none could be spared from the shipyards. In place of welded joints, special couplings are used. These allow a certain amount of expansion in length in the line. Where only welded joints could stand the strain of pressure, "anchors" are used—these anchors are small concrete piers through which the lines run at points where it bends, and relieves the joints of all abnormal strain.

WLB Denies Union's Request

Milwaukee

• • • A request by the employee's independent union representing 3000 workers at Kearney & Trecker Corp. for amendments and changes in its agreement with the company has been denied by the Sixth Regional War Labor Board.

Warehouse Orders Are Consolidated by WPB

Washington

• • • **WPB has issued a new steel warehouse order M-21-B-3, effective Feb. 1, which eliminates certain features formerly in orders M-21-B-1 and M-21-B-2 which have been revoked and combines the balance of their provisions.**

Prominent features of the new order include the elimination of base tonnages and warehouse certificates on general steel products and a new requirement to set up an internal record of the replaceable tonnage sold from stock as compared with tonnage ordered. The former orders assumed that this record had been kept but the new order makes such records mandatory. Separate records must be established for general steel products and merchant trade products. Schedule A of the new order defines general steel products while merchant trade products are listed in schedule B.

The new order changes the endorsement required of distributers on their stock replacement orders making it necessary for each order to be identified as a general steel product replacement order or as a merchant trade product replacement order. Certification must also include the standard endorsement authorized in Priorities Reg. 7.

New Titanium Steel For Vitreous Enameling

(CONTINUED FROM PAGE 63)

clean, silvery white surface.

In actual enameling, while practically all types of cover coats can be applied directly to the titanium steel and fired without blemish, certain enamels are better suited than others. Zircon enamels (antimony free) yield generally better surfaces and withstand repeated refirings without defect or loss of opacity. Antimony enamels are more sensitive to development of defects and lose opacity on overfiring, but develop better adherence than zircon enamels. However, adherence is promoted by use of sand blasted surfaces, and with proper care the adherence obtained with zircon enamels is adequate.

Using white directly on the steel, a somewhat harder fire is required than when used as a normal cover coat. A temperature 20 deg. to 30 deg. F. higher than normal should be used. Underfiring defects are easily recog-

nized as small, perfectly round open blisters with a slightly raised edge. If the defect disappears on refiring, underfiring is the cause.

Some difficulty may be experienced in spraying due to lack of contrast. Dyed enamels may help in this regard, and if dipping is practical, such practice may be followed. Scuffing or scratching of the bisqued enamel should be avoided.

One-coat one-fire finishes should be attempted only if the operator is certain all precautions listed above can be met adequately in the shop. If not, a safety or insurance factor is the use of two half coats with a double burn. Then as familiarity with the stock and practice is developed the full one-coat one-fire application may be incorporated gradually.

Assuming that the correct practices as outlined above are carried out with adequate care, this new titanium steel may be considered the first practical approach to the ideal sheet steel base for vitreous enameling.

Commercially, the advantages may be listed as follows, assuming recommended practice in steel making, pickling, and enameling:

(1) Elimination of enamel boiling due to steel defects.
(2) Elimination of ground coat.
(3) Elimination of copper heading.
(4) Improved sag resistance.
(5) Improved resistance to warping.
(6) Excellent deep drawing qualities.
(7) Use of conventional cover coats directly on the steel.
(8) Complete resistance to hydrogen penetration or absorption.

As a result of the above advantages the following benefits may be expected:

(1) Lighter enamel weights and coats.
(2) Reduction of chippage and mechanical breakage losses.
(3) Increase in production efficiency through reduction of rework and re-operation.
(4) Use of lighter gauge stock than normal.
(5) Sharply improved thermal shock resistance of white enamel due to ground coat elimination and much thinner overall enamel thickness.
(6) Overall cost reduction for enameled ware.
(7) Increase in production speed with no increase in production facilities.
(8) Even when ground coat is used all the advantages are operative, particularly from a coat reduction standpoint.

The disadvantages over normal practice may be listed as follows:

(1) The necessity for nickel flashing or other special procedure for development of enamel adherence.
(2) Close control of pickle practice and high degree of cleaniness in the enamel shop generally.
(3) Operating techniques somewhat different than when ground coat is used.
(4) Necessity for handling the steel in such fashion that pronounced scratching of the surface is eliminated.

The disadvantages are of such nature that they may be eliminated or disregarded if sufficient emphasis is laid on the shop practices recommended for their elimination.

MACHINE TOOLS

. . . News and Market Activities

Machine Tool Makers Pose Unusual Manpower Priority Problem

Cleveland

• • • Machine tool makers, who are engaged in a multitude of programs these days, have presented a manpower priority problem that has not been altogether simple. At the moment, those concerned with the heavy ammunition program are getting a higher priority if they need men (and who doesn't) and those parts of the industry not directly related to the heavy ammunition program are also getting priority ratings sufficiently high to fill their needs.

Priorities are set locally by the area director of the War Manpower Commission, with the advice of his priority committee which is composed of representatives of the procurement services, the War Production Board and other manpower claimants.

In part, priorities are based upon the urgency of the product, which is determined primarily by a Washington committee which decides whether the product being made is urgently needed. The second consideration is how far back in production the company is and if the production lag is due to a manpower shortage.

In this same category it is worthwhile to note that gate hiring has hardly been what could be termed successful in this area, so far as the machine tool companies are concerned. A glance at the figures for five companies over a period of four weeks showed that in every case, the companies were forced to turn again to USES despite the fact that all of them had been accorded the accolade of gate-hiring.

It seems rather questionable at this time, in view of the varied and constant pressures, most of which are quasi-official, that are being exerted upon those in less-essential activities, that any man under the shadow of the draft would go to a gate for employment when seemingly more official channels through USES are available.

A man who has been ordered by his draft board to take an essential job is not likely to go to the nearest plant simply because they are hiring at the gate and at this time, the intangible number of available employables would appear to be long since past the point of being impressed by a plant's importance in the effort simply because they do their hiring at the gate.

Personnel men have pointed out many times that it is a helpful adjunct at some stages of the game when an employee can bring a friend to work with him and application and acceptance, as the case may be, can be made on the spot. Further, it solves one of the better bogeys, transportation, for another worker, but no combination of these factors has apparently made too much difference in the case of the machine tool plants and it is not unlikely that a national survey of gate hiring in these cases might show the same result as the Cleveland area.

•

Cemented Carbides Usage May Be Cut

Washington

• • • Breakage, careless or bad grinding of carbide tips and poor machine practices were some of the factors cited by the Cemented Carbide Manufacturers Industry Advisory Committee at its first meeting last week as contributing to the increased demands for cemented carbide cutting tools. Several committee members said that contractors could cut average requirements for critical carbide tools 50 per cent by better tool usage.

Heavier requirements for these tools to machine shells and Navy rockets were brought to the attention of the committee by WPB officials.

Discussion also dealt with the possibility of screening orders under General Scheduling Order M-293 to assure equitable distribution of carbide tool blanks and to the need for increased allocation of steel for blanks. It was agreed that Form WPB-3014, quarterly report on cemented carbide production, shipments, orders and inventories, should be replaced by a monthly report.

Fourth quarter 1944 shipments by cemented carbide manufacturers were valued at $8,803,000 for all products, including tool blanks, dies, mandrels and shell cores for domestic, foreign and lend-lease claimants, the committee was told. Shipments of blanks for turning tools, including those for shell-turning totaled $5,761,000 during the last quarter of 1944. Orders received for turning tools during this same period total $5,752,000.

•

Guarantees Increased Output in Return For Soldiers

Cleveland

• • • A guarantee of 25 per cent increase in production has been offered to the military and manpower authorities by the National Tool Co. in exchange for the release of 50 of its "prime essential" skilled workmen from the armed forces; in addition, it offers 50 other, less-skilled men from its shop forces to replace them, Samuel J. Kornhauser, president, declared recently. The company is a large maker of precision cutting tools.

The list prepared by Mr. Kornhauser comprises 30 grinders and lapping machine operators; 17 lathe, milling machine and relieving machine operators; one set-up man; one toolmaker, and one tool engineer.

•

Steel Overshoes for Tanks Will Be Produced by Chrysler

Evansville, Ind.

• • • Chrysler Corp. is beginning this week the mass production of steel overshoes for tank treads, on order from the Ordnance Department for installation in General Sherman tanks now in service in Europe.

The overshoes, known as grousers, are designed to improve traction on muddy terrain. When fitted over the treads, perpendicular to the tank hull, they widen present tread surface by 16 in.

Initial production will turn out 2000 sets, comprising approximately 350,000 separate pieces. Several hundred persons will be engaged in the work on a three-shift basis.

Again-

SUPER

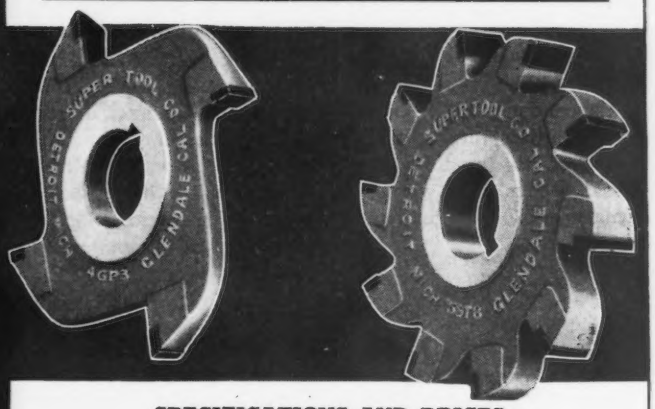
Milling Cutters

SUPER has done it again! For the second time in less than a year, prices on Super Carbide Tipped Milling Cutters have been reduced! And it is a big reduction, too . . . again made possible because of an increased demand for these fast, economical cutters that has resulted in increased production and greater manufacturing economies. Take a look at the new low prices shown in the charts at the right . . . then place your order TODAY for these Super Carbide Tipped Milling Cutters that now, more than ever, will step down your costs while they are stepping up your production.

SPECIFICATIONS AND PRICES

Cutters for Cast Iron, Brass, Bronze, Aluminum, Etc.

Tool Order No.	Diameter	Width	Hole	No. of Teeth	Price Each
3-GP-1	3"	1/4"	1"	4	$ 9.75
3-GP-2	3"	5/16"	1"	4	9.75
3-GP-3	3"	3/8"	1"	4	10.00
3-GP-4	3"	7/16"	1"	4	11.00
3-GP-5	3"	1/2"	1"	4	12.00
4-GP-1	4"	1/4"	1"	4	12.00
4-GP-2	4"	5/16"	1"	4	12.00
4-GP-3	4"	3/8"	1" or 1¼"	4	12.25
4-GP-4	4"	7/16"	1"	4	13.00
4-GP-5	4"	1/2"	1" or 1¼	4	13.50
4-GP-6	4"	9/16"	1"	4	15.00
4-GP-7	4"	5/8"	1" or 1¼"	4	16.00
4-GP-8	4"	3/4"	1" or 1¼	4	17.00
4-GP-9	4"	7/8"	1" or 1¼"	4	25.00
5-GP-4	5"	7/16"	1¼"	6	17.25
5-GP-5	5"	1/2"	1" or 1¼	6	17.50
5-GP-6	5"	9/16"	1¼"	6	18.00
5-GP-7	5"	5/8"	1¼"	6	18.25
5-GP-8	5"	3/4"	1" or 1¼"	6	20.50
5-GP-10	5"	1"	1¼"	6	27.50
6-GP-5	6"	1/2"	1" or 1¼"	6	21.00
6-GP-7	6"	5/8"	1¼"	6	22.00
6-GP-8	6"	3/4"	1" or 1¼"	6	26.00
6-GP-10	6"	1"	1¼"	6	30.00
7-GP-8	7"	3/4"	1¼"	8	30.00
7-GP-10	7"	1"	1¼"	8	33.00
8-GP-8	8"	3/4"	1¼" or 1½"	8	35.00
8-GP-10	8"	1"	1¼" or 1½"	8	38.50



SPECIFICATIONS AND PRICES

Cutters for Use in Steel

Tool Order No.	Diameter	Width	Hole	No. of Teeth	Price Each
3-ST-1	3"	1/4"	1"	6	$14.00
3-ST-2	3"	5/16"	1"	6	14.00
3-ST-3	3"	3/8"	1"	6	14.25
3-ST-4	3"	7/16"	1"	6	15.50
3-ST-5	3"	1/2"	1"	6	16.25
4-ST-1	4"	1/4"	1"	8	17.00
4-ST-2	4"	5/16"	1"	8	17.75
4-ST-3	4"	3/8"	1" or 1¼"	8	18.25
4-ST-4	4"	7/16"	1"	8	18.75
4-ST-5	4"	1/2"	1" or 1¼"	8	19.50
4-ST-6	4"	9/16"	1"	8	20.75
4-ST-7	4"	5/8"	1" or 1¼	8	21.50
4-ST-8	4"	3/4"	1" or 1¼"	8	22.00
4-ST-9	4"	7/8"	1" or 1¼"	8	30.00
5-ST-4	5"	7/16"	1¼"	10	22.50
5-ST-5	5"	1/2"	1" or 1¼"	10	23.00
5-ST-6	5"	9/16"	1¼"	10	25.50
5-ST-7	5"	5/8"	1¼"	10	26.50
5-ST-8	5"	3/4"	1" or 1¼"	10	30.00
5-ST-10	5"	1"	1¼"	10	35.00
6-ST-5	6"	1/2"	1" or 1¼"	12	33.75
6-ST-7	6"	5/8"	1¼"	12	35.00
6-ST-8	6"	3/4"	1" or 1¼	12	37.00
6-ST-10	6"	1"	1¼"	12	40.00
7-ST-8	7"	3/4"	1¼"	12	39.00
7-ST-10	7"	1"	1¼"	12	45.00
8-ST-8	8"	3/4"	1¼" or 1½"	12	40.00
8-ST-10	8"	1"	1¼" or 1½"	12	50.00

Variations from above specifications subject to special quotation.

SUPER TOOL COMPANY

Carbide Tipped Tools

21650 Hoover Road, Detroit 13, Michigan ★ 4105 San Fernando Road, Glendale 4, California

NON-FERROUS METALS

. . . News and Market Activities

Bolivian Tin Purchase Agreement Near

New York

• • • **It is understood that virtually** all revised provisions of the contract between Bolivian tin producers and the Metal Reserve Co. have been agreed upon. In effect, there is an advance in price to 62c. per lb. retroactively for the period from July 1 to December 18, 1944, and 63½c., plus a bonus of 1½c., from the latter date until June 30, 1945. Detailed provisions establish exact prices in accordance with the quality of the concentrate delivered.

This contract has been the subject of negotiation for a long time and details of its modification released several weeks ago were apparently premature. The original contract, executed November 4, 1940, called for a price of 48½c. per lb. at South American ports. The coming agreement will contain a standard labor clause which stipulates that miners' living and working conditions must be satisfactory on the basis of Bolivian standards, and that wages must meet prevailing Bolivian wage levels.

The labor clauses of the present agreement were forecast several years ago when a U. S. mission was sent to Bolivia to study how tin concentrate production could be increased. At that time the report recommended the establishment of minimum wage standards to cover improved working conditions and other reforms, many of which have been incorporated in the forthcoming agreement.

o o o

Flameproofing Demands Restrict Antimony Use

New York

• • • **Drastically increased demand** for antimony for flame-proofing canvas used for Army tents and other shelters and for the manufacture of flame retarding ship paint has required WPB to resume full control of deliveries and use of this metal. Order M-112, revised as of February 10, provides that no person may obtain more than a long ton of antimony in any month whether as ore, metal, liquated antimony, oxide, sulphide, or alloy containing 50 per cent or more antimony, except by allocation. Inventories of antimony ore are limited to 45 days' supply, all other forms of antimony to 30 days' supply. Free from government control since December, 1942, WPB officials report that the demand has doubled in each of the last four months and that current demand for all types of the metal exceeds current production by a wide margin. Available ore in South America and Mexico are adequate. However, lack of shipping space and rail transportation difficulties are cutting into ore inventories here. Furthermore, there is a lack of facilities for converting ore into the antimony oxide used in flameproofing. Plans have been effected to increase these facilities, but until they are operative civilian uses of antimony for batteries, ceramic paints, enamelware, etc., must be sharply curtailed.

•

WPB Orders Increased Aluminum Production

Washington

• • • **Not long after the closing of** aluminum sheet order books by decree for the first quarter of 1945, WPB has directed a 10 million lb. increase in monthly aluminum ingot production by four plants whose operations had been curtailed. The aluminum plants from which WPB requested increased production included the Aluminum Co. of America's mills at Massena, N. Y.; Badin, N. C., and Niagara Falls, N. Y., and the DPC plant at Spokane, Wash., with Alcoa providing 4 million lb. of the expected increase and DPC 6 million lb. This 10 million lb. of additional production will be initiated as soon as manpower is available, WPB said.

At the same time, WPB reported that aluminum sheet mills would be allowed to accept additional orders for April and subsequent months. The order books on aluminum sheets were closed on Jan. 6 for the first four months of 1945 to allow military procurement agencies to adjust allotments and schedule deliveries to meet critical programs.

Production of aluminum sheet has increased from about 55 million lb. to about 80 million lb. monthly since the first of December.

•

Spanish Mercury Will Be Offered Here Soon

New York

• • • **The current shortage in** supplies of mercury caused by its expanded use for the miniature dry battery program coupled with reduced domestic production is expected to be relieved somewhat by offerings of Spanish mercury in the New York market.

Mercurio Europio which markets the mercury production of the Almaden mines in Spain will make its offerings through Metal Traders, Inc., 67 Wall St., New York. While there may be no arrivals of mercury for the next several months, or until shipping space is available, it is expected that offerings will be on the basis of $160 per flask, U. S. duty of $19 paid. The prospect has already created an easier domestic supply position in the metal as futures are now being offered again. It is reported that the New York price has dropped a little from its recent high of $175.

It is recalled that the quality of Spanish cinnabar ores and the cost of Spanish labor are such as to have permitted importation into this country at less than half current market prices.

•

May Use Treasury Silver

New York

• • • **Manufacturers of sterling silverware** can now obtain Treasury silver if necessary to complete their production quotas authorized by order M-199. This order restricts the use of silver by these manufacturers to 50 per cent of 1941 or 1942 use, whichever is greater. Prior to the issuance of Direction 3 to the order, only domestic silver could be used for the purpose.

Primary Metals

(Cents per lb., unless otherwise noted)

Aluminum, 99+%, del'd. (Min. 10,000 lb.)	15.00
Antimony, American, Laredo, Tex.	14.50
Beryllium copper, 3.75-4.25% Be; dollars per lb. contained Be	$17.00
Cadmium, del'd	90.00
Cobalt, 97-99% (per lb.)	$1.50 to $1.57
Copper, electro, Conn. valley	12.00
Copper, electro, New York	11.75
Copper, lake	12.00
Gold, U. S. Treas., dollars per oz.	$35.00
Indium, 99.5%, dollars per troy oz.	$4.50
Iridium, dollars per troy oz.	$120.00
Lead, St. Louis	6.35
Lead, New York	6.50
Magnesium, 99.9 + %, carlots	20.50
Magnesium, 12-in. sticks, carlots	27.50
Mercury, dollars per 76-lb. flask, f.o.b. New York	$170.00 to $175.00
Nickel, electro	35.00
Palladium, dollars per troy oz.	$24 00
Platinum, dollars per oz.	$35.00
Silver, open market, New York, cents per oz.	44.75
Tin, Straits, New York	52.00
Zinc, East St. Louis	8.25
Zinc, New York	8.65

Remelted Metals

(Cents per lb. unless otherwise noted)

Aluminum, No. 12 Fdy. (No. 2)	9.00 to 10.00
Aluminum, deoxidizing No. 2, 3, 4	6.00 to 9.50
Brass Ingot	
85-5-5-5 (No. 115)	13.25
88-10-2 (No. 215)	16.75
80-10-10 (No. 305)	16.00
No. 1 Yellow (No. 405)	10.25

Copper, Copper Base Alloys

(Mill base, cents per lb.)

	Extruded Shapes	Rods	Sheets
Copper	20.87	....	20.37
Copper, H.R.	....	17.37	....
Copper drawn	....	18.37	....
Low brass, 80%	....	20.40	20.15
High brass	....	....	19.48
Red brass, 85%	....	20.61	20.36
Naval brass	20.37	19.12	24.50
Brass, free cut	....	15.01	....
Commercial bronze, 90%	....	21.32	21.07
Commercial bronze, 95%	....	21.53	21.28
Manganese bronze	24.00	....	28.00
Phos. bronze, A, B, 5%	....	26.50	26.25
Muntz metal	20.12	18.87	22.75
Everdur, Herculoy, Olympic or equal	....	25.50	26.00
Nickel silver, 5%	....	28.75	26.50
Architect bronze	19.12	....	....

Aluminum

(Cents per lb., subject to extras on page, size, temper, finish, factor number, etc.)

Tubing: 2 in. O.D. x 0.065 in. wall 2S, 40c. (½H); 52S, 61c. (O); 24S, 67½c. (T).

Plate: 0.250 in. and heavier; 2S and 3S, 21.2c.; 52s, 24.2c.; 61S, 22.8c.; 24S, 24.2c.

Flat Sheet: 0.188 in. thickness; 2S and 3S, 22.7c. a lb.; 52S, 26.2c.; 61S, 24.7c.; 24S, 26.7c.

2000-lb. base for tubing; 30,000-lb. base for plate, flat stock.

Extruded Shapes: "As extruded" temper; 2000-lb. base, 2S and 3S, factor No. 1 to 4, 25.5c.; 14S, factor No. 1 to 4, 35c.; 17S, factor No. 1 to 4, 31c.; 24S, factor No. 1 to 4, 34c.; 53S, factor No. 1 to 4, 28c.; 61S, factor No. 1 to 4, 28½c.

The factor is determined by dividing perimeter of shape by weight per lineal foot.

Wire Rod and Bar: Base price; 17ST and 11ST-3, screw machine stock. Rounds: ¼ in., 28½c. per lb.; ½ in., 26c.; 1 in., 24½c.; 2 in., 23c. Hexagonals; ¼ in., 34½c. per lb.; ½ in., 28½c.; 1 in., 25½c.; 2 in., 25½c. 2S, as fabricated, random or standard lengths, ¼ in., 34c. per lb.; ½ in., 25c.; 1 in., 24c.; 2 in., 23c. 24ST, rectangles and squares, random or standard lengths. 0.093-0.187 in. thick by 1.001-2.000 in. wide, 33c. per lb.; 0.751-1.500 in. thick by 2.001-4.000 in. wide, 29c.; 1.501-2.000 in. thick by 4.001-6.000 in. wide, 27½c.

Magnesium

Sheet, rod, tubes, bars, extruded shapes subject to individual quotations. Metal turnings: 100 lb. or more, 46c. a lb.; 25 to 90 lb., 56c.; less than 25 lb., 66c.

NON-FERROUS SCRAP METAL QUOTATIONS

†*(OPA basic maximum prices, cents per lb., f.o.b. point of shipment, subject to quality, quantity and special preparation premiums—other prices are current quotations)*

Copper, Copper Base Alloys

OPA Group 1†

No. 1 wire, No. 1 heavy copper	9.75
No. 1 tinned copper wire, No. 1 tinned heavy copper	9.75
No. 2 wire, mixed heavy copper	8.75
Copper tuyeres	8.75
Light copper	7.75
Copper borings	9.75
No. 2 copper borings	8.75
Lead covered copper wire, cable	6.00*
Lead covered telephone, power cable	6.04
Insulated copper	5.10*

OPA Group 2†

Bell metal	15.50
High grade bronze gears	13.25
High grade bronze solids	11.50*
Low lead bronze borings	11.50*
Babbitt lined brass bushings	13.00
High lead bronze solids	10.00*
High lead bronze borings	10.00*
Red trolley wheels	10.75
Tinny (phosphor bronze) borings	10.50
Tinny (phosphor bronze) solids	10.50
Copper-nickel solids and borings	9.25
Bronze paper mill wire cloth	9.50
Aluminum bronze solids	9.00
Soft red brass (No. 1 composition)	9.00
Soft red brass borings (No. 1)	9.00
Gilding metal turnings	8.50
Contaminated gilded metal solids	8.50
Unlined standard red car boxes	8.25
Lined standard red car boxes	7.75
Cocks and faucets	7.75
Mixed brass screens	7.75
Red brass breakage	7.50
Old nickel silver solids, borings	6.25
Copper lead solids, borings	6.25
Yellow brass castings	6.25
Automobile radiators	7.00
Zincy bronze borings	8.00
Zincy bronze solids	8.00

OPA Group 3†

Fired rifle shells	8.25
Brass pipe	7.50
Old rolled brass	7.00
Admiralty condenser tubes	7.50
Muntz metal condenser tubes	7.00
Plated brass sheet, pipe reflectors	6.50
Manganese bronze solids	7.25[1]
Manganese bronze solids	6.25[2]
Manganese bronze borings	6.50[1]
Manganese bronze borings	5.50[2]

OPA Group 4†

Refinery brass	4.75*

*Price varies with analysis. [1] Lead content 0.00 to 0.40 per cent. [2] Lead content 0.41 to 1.00 per cent.

Other Copper Alloys

Briquetted Cartridge Brass Turnings	8.625
Cartridge Brass Turnings, Loose	7.875
Loose Yellow Brass Trimmings	7.875

Aluminum

Plant scrap, segregated

2S solids	8.00
Dural alloys, solids 14, 17, 18, 24S	4.00
25S turnings, dry basis	2.00
Low copper alloys 51, 52, 61, 63S solids	7.00
turnings, dry basis	5.00

Plant scrap, mixed

Solids	3.50
Turnings, dry basis	1.50

Obsolete scrap

Pure cable	8.00
Old sheet and utensils	5.00
Old castings and forgings	4.00
Pistons, free of struts	4.00
Pistons, with struts	3.00
Old alloy sheet	4.00

Magnesium*

Segregated plant scrap

Pure solids and all other solids, exempt Borings and turnings	1.50

Mixed, contaminated plant scrap

Grade 1 solids	3.00
Grade 1 borings and turnings	2.00
Grade 2 solids	2.00
Grade 2 borings and turnings	1.00

*Nominal.

Zinc

New zinc clippings, trimmings	6.50
Engravers, lithographers plates	6.50
Old zinc scrap	4.75
Unsweated zinc dross	5.00
Die cast slab	4.50
New die cast scrap	4.45
Radiator grilles, old and new	3.50
Old die cast scrap	3.00

Lead

Deduct 0.55c. a lb. from refined metal basing point prices or soft and hard lead including cable, for f.o.b. point of shipment price.

Nickel

Ni content 98+%, Cu under ½%, 26c. per lb.; 90 to 98% Ni, 26c. per lb. contained Ni.

ELECTROPLATING ANODES AND CHEMICALS

Anodes

(Cents per lb., f.o.b. shipping point)

Copper: Cast, elliptical, 15 in. and longer	25½
Electrolytic, full size	22⅞
cut to size	30½
Rolled, oval, straight, 15 in. and longer	23¼
Curved	24¼
Brass Cast, 82-20, elliptical, 15 in. and longer	23⅝
Zinc: Cast, 99.99, 16 in. and over	16¼
Nickel: 99% plus, cast	47
Rolled, depolarized	48
Silver: Rolled, 999 fine per Troy (1-9) oz., per oz.	58

Chemicals

(Cents per lb., delivery from New York)

Copper cyanide, tech., 100-lb. bbls. 1-5	5.65
Copper sulphate, 99.5 crystals, bbls.	13.00-13.50
Nickel salts, single, 425-lb. bbls.	34.00
Silver cyanide, 100 oz. lots	40.82-41.125
Sodium cyanide, 96% dom., 100-lb. dms.	0.15
Zinc, cyanide, 100-lb. dms.	33.00
Zinc, sulphate, 89% crystals, bbls.	6.80

SCRAP

. . . News and Market Activities

Market Quiet; May Anticipate Change

• • • The scrap market seems to be marking time this week after the period of railroad embargoes, and snowed-in yards and freight handling facilities. There are no significant price changes or other developments except in one or two markets where small decreases in the price of turnings and borings continue.

It is generally believed that there is no immediate significance to the recent widespread reductions in the price of blast furnace scrap grades. Dealers generally attribute this development to the shell production program expansion where, in producing areas such as Detroit, the output of turnings is said to be mountain-like. Turnings are usually handled on a continuous production basis by means of conveyors and hoppers by which they are transmitted directly into waiting gondola cars. Any stoppage in supply of empty cars because of the railroad embargo or cold weather naturally halts this economical method of handling turnings. In such advent producers are eager to move them at any price just to get them out of the way.

However, it is true that there are incipient indications of a change in market psychology. It is far too early to determine whether the reports this week from Chicago and New York indicate that such a change is coming. But coupled with the advancing Russian front, however, it might be well to give some weight to these factors in attempting to forecast future market trends.

•

PITTSBURGH—Scrap movements have improved perceptibly, but demand still outweighs supply greatly in all grades except turnings. The turning items show weakness and prices have dropped another 50c. a ton in the machine shop and borings and turnings classes. Car demand is very great, with one mill reporting over the weekend that operations were curtailed because of lack of cars for outbound shipments, and dealers all indicating that they could use far more cars than they are getting. Yards are still under snow and scrap processing and preparing is at a minimum.

•

CHICAGO—No evidences of strength have appeared in the very dull local market during the past week. Absence of mill transactions makes difficult exact appraisal of prices, but it appears likely that dealer bundles will be the next item to feel a corrective adjustment downwards. Desire of mills to guard shrinking coke inventories may result in some purchases of blast furnace grades.

•

DETROIT—No change was registered this week in local scrap quotations. Open hearth and electric furnace grades continue in good demand, with local interests in the market, while turnings remain weak. Contracts held by most local dealers have been extended by the mills to cover the days lost by recent freight embargoes.

•

BOSTON — Business has been paralyzed since the violent northeast storm of February 8, which not only buried yards in deep snow, but put railroads out of business as far as setting cars on sidings and made highways impassable. Previous to the storm a fair tonnage in truckloads was delivered to foundries, but car shipments were practically nil. Weakness has developed in borings and turnings, due to an accumulation and to lack of demand. Prices average $1 a ton lower.

•

BUFFALO — Demand for spot scrap continues urgent as a sharp rise in steel operations has more than offset the loosening up of supplies under improved weather conditions and removal of freight restrictions. Turnings are beginning to show signs of softness, largely in sympathy with midwestern markets, but all prices are unchanged at the ceiling. With the bogey of war contract terminations in the offing, the spirit of caution appears stronger in the trade. Consequently dealers generally are striving for a close balance between receipts and shipments to avoid accumulations of unprepared scrap in their yards. Consumers and dealers alike are inclined to minimize the threat of a zoning plan, expressing the opinion that there is no need for restrictions on cross-hauling in this district. One leading consumer has informed dealers that unfilled contracts will remain in force for the next month where efforts to make deliveries were prevented by storms and freight tie-ups. Contracts were made at ceiling prices.

•

NEW YORK—Scrap movement in this district continues hampered by labor shortage and snow and ice remaining from recent freezing weather. While prices of all grades remain at ceilings here, it is reported that mills are refusing to pay the water rate for New England turnings. This is considered to be some indication that turnings may be expected to drop soon in this district.

•

PHILADELPHIA — Greatest problem this week has been the difficulty in getting empty freight cars. Shipments for the past two weeks have been slight because of the freight embargoes and mills are badly in need of scrap. Most of the business conducted for the past two weeks has been limited to paper transactions with little scrap moving in and out of yards. When freight cars are finally obtained, not much scrap is expected to move since yards are having a hard time getting the men to prepare the scrap. Little scrap has been stored in yards during the embargo periods and mills will probably face some severe scrap shortages since the quantities of industrial scrap are certainly not sufficient to keep them going at full capacity.

•

CLEVELAND—Open hearth scrap is practically non-existent here. Turnings, of course, are available in quantity and buyers are turning away from them. Dealers have enough orders for this month and the weather at last is showing some signs of breaking. Otherwise there is little activity with dealers playing the game very close to their belts.

•

CINCINNATI—Some softness has developed in the market in this area, and borings and turnings are now being quoted approximately $1.00 under the price of a week ago. Flow of material also has been curtailed because of the reduction in railroad lists and the weather conditions handicapping the collection of country scrap. Sufficient supply, however, is still reported available to keep production and meet current demands which, of course, has been aided materially by the good inventories of consumers.

•

BIRMINGHAM — Consumers in this market are showing a reluctance to place any orders except for material to meet immediate requirements and demand seems to be weakening here for all grades of scrap. For the present, however, no changes in prices are reported.

•

ST. LOUIS—With weather conditions improving, the last week saw a slight increase in the movement of scrap iron to this market, but a shortage of labor is retarding the processing. Open hearth grades are still badly needed, but cast grades are easier and mills decline to pay the freight premium to bring them here. Borings and turnings are off, while stove plate has gone back to the ceiling price.

Flood Threat Diminishes

Pittsburgh

• • • The thaw of the past few days, which is expected to continue for another day or two, is gradually clearing the western Pennsylvania area of the deep snow which has been a flood potential since mid-December. While many of the tributary streams of the Allegheny and Monongahela rivers are swollen, the gage at the confluence of these two main streams was only at pool stage, somewhere in the neighborhood of about 17 ft.

Going prices as obtained in the trade by IRON AGE editors, based on representative tonnages (for ceiling prices see O. P. A. schedule No. 4). Where ceiling prices are quoted they do not include brokerage fee or adjusted transportation charges. Asterisks indicate grades selling at ceilings.

PITTSBURGH

Per gross ton delivered to consumer:

No. 1 hvy. melting	$20.00*
RR. hvy. melting	21.00*
No. 2 hvy. melting	20.00*
RR. scrap rails	21.50*
Rails 3 ft. and under	23.50*
No. 1 comp'd sheets	20.00*
Hand bdld. new shts.	20.00*
Hvy. axle turn.	19.00*
Hvy. steel forge turn.	19.00*
Mach. shop turn.	$14.00 to 14.50
Short shov. turn.	16.50 to 17.00
Mixed bor. and turn.	14.00 to 14.50
Cast iron borings	16.00*
Hvy. break. cast	16.50*
No. 1 cupola	20.00*
RR. knuck. and coup.	24.50*
RR. coil springs	24.50*
Rail leaf springs	24.50*
Rolled steel wheels	24.50*
Low phos. bil. crops	25.00*
Low phos.	22.50*
RR. malleable	22.00*

CHICAGO

Per gross ton delivered to consumer:

No. 1 hvy. melting	$18.75*
No. 2 hvy. melting	18.75*
No. 1 bundles	18.75*
No. 2 dealers' bndls.	$16.25 to 16.75
Galv. bundles	14.25 to 14.75
Mach. shop turn.	9.50 to 10.00
Short shovel. turn.	10.25 to 10.75
Cast iron borings	10.25 to 10.75
Mix. borings & turn.	10.25 to 10.75
Low phos. hvy. forge	23.75*
Low phos. plates	21.25*
No. 1 RR hvy. melt.	19.75*
Reroll rails	22.25*
Miscellaneous rails	20.25*
Rails 3 ft. and under	22.25*
Locomotive tires, cut	24.25*
Cut bolsters & side frames	22.25*
Angles & splice bars	22.25*
St'dard stl. car axles	25.75*
No. 3 steel wheels	22.75 to 23.25
Couplers & knuckles	23.25*
Agricul. malleable	22.00*
RR. malleable	22.00*
No. 1 mach. cast	20.00*
No. 1 agricul. cast	20.00*
Hvy. breakable cast	16.50*
RR. grate bars	15.25*
Cast iron brake sh's	15.25*
Stove plate	19.00*
Clean auto cast	20.00*
Cast iron carwheels	20.00*

CINCINNATI

Per gross ton delivered to consumer:

No. 1 hvy. melting	$18.00 to $18.50
No. 2 hvy. melting	18.00 to 18.50
No. 1 bundles	18.00 to 18.50
No. 2 bundles	18.00 to 18.50
Mach. shop turn.	8.50 to 9.00
Shoveling turn.	10.50 to 11.00
Cast iron borings	8.50 to 9.50
Mixed bor. & turn.	8.50 to 9.50
Low phos. plate	20.50 to 21.50
No. 1 cupola cast	20.00*
Hvy. breakable cast	16.50*
Stove plate	16.00 to 16.50
Scrap rails	20.00 to 21.00

BOSTON

Dealers' buying prices per gross ton, f.o.b. cars

No. 1 hvy. melting	$15.05*
No. 2 hvy. melting	15.05*
No. 1 and 2 bundles	15.05*
Busheling	15.05*
Turnings, shovelings	11.06
Machine shop turn.	9.06
Mixed bor. & turn.	9.00 to 9.06
Cl'n cast, chem. bor.	$13.06 to 14.15*
Truck delivery to foundry	
Machinery cast	21.00 to 23.51*
Breakable cast	21.57 to 21.87*
Stove plate	20.00 to 23.51*

DETROIT

Per gross ton, brokers' buying prices:

No. 1 hvy. melting	$17.32*
No. 2 hvy. melting	17.32*
No. 1 bundles	17.32*
New busheling	17.32*
Flashings	17.32*
Mach. shop turn.	$8.50 to 9.00
Short shov. turn.	11.00 to 11.50
Cast iron borings	10.00 to 10.50
Mixed bor. & turn.	9.00 to 9.50
Low phos. plate	18.50 to 19.82
No. 1 cupola cast	20.00*
Charging box cast	18.00 to 19.00
Hvy. breakable cast	15.50 to 16.50
Stove plate	18.50 to 19.00
Automotive cast	20.00*

PHILADELPHIA

Per gross ton delivered to consumer:

No. 1 hvy. melting	$18.75*
No. 2 hvy melting	18.75*
No. 2 bundles	18.75*
Mach. shop turn.	13.75*
Shoveling turn.	15.75*
Cast iron borings	14.75*
Mixed bor. & turn.	13.75*
No. 1 cupola cast	20.00*
Hvy. breakable cast	16.50*
Cast, charging box	19.00*
Hvy. axle, forge turn	18.25*
Low phos. plate	21.25*
Low phos. punchings	21.25*
Billet crops	21.25*
RR. steel wheels	23.25*
RR. coil springs	23.25*
RR. malleable	22.00*

ST. LOUIS

Per gross ton delivered to consumer:

Heavy melting	$17.50*
Bundled sheets	17.50*
Mach. shop turn.	8.50 to 9.00
Hvy. axle turn.	16.75
No. 1 locomo. tires	20.00
Misc. std. sec. rails	19.00*
Rerolling rails	21.00*
Steel angle bars	21.00*
Rails 3 ft. and under	21.50*
RR. springs	22.00*
Steel car axles	21.50 to 22.00
Stove plate	19.00*
Grate bars	15.25*
Brake shoes	15.25*
RR. malleable	22.00*
Cast iron carwheels	18.50*
No. 1 mach'ery cast	20.00*
Breakable cast	16.50*

BIRMINGHAM

Per gross ton delivered to consumer:

No. 1 hvy. melting	$17.00*
No. 2 hvy. melting	17.00*
No. 2 bundles	17.00*
No. 1 busheling	17.00*
Long turnings	$9.50 to 10.00
Cast iron borings	9.50 to 10.00
Bar crops and plate	19.50*
Structural and plate	19.50*
No. 1 cast	20.00*
Stove plate	17.00
Steel axles	18.00*
Scrap rails	18.50
Rerolling rails	20.50*
Angles & splice bars	20.50*
Rails 3 ft. & under	21.00*
Cast iron carwheels	16.50 to 17.00

YOUNGSTOWN

Per gross ton delivered to consumer:

No. 1 hvy. melting	$20.00*
No. 2 hvy. melting	20.00*
Low phos. plate	22.50*
No. 1 busheling	20.00*
Hydraulic bundles	20.00*
Mach. shop turn.	$13.50 to 14.00
Short shovel. turn.	16.00 to 16.50
Cast iron borings	15.00 to 15.50

NEW YORK

Dealers' buying prices, per gross ton, on cars

No. 1 hvy. melting	$15.33*
No. 2 hvy. melting	15.33*
Comp. black bundles	15.33*
Comp. galv. bundles	13.33*
Mach. shop turn.	10.33*
Mixed bor. & turn.	10.33*
No. 1 cupola cast	20.00*
Hvy. breakable cast	16.50*
Charging box cast	19.00*
Stove plate	19.00*
Clean auto cast	20.00*
Unstrip. motor blks.	17.50*
Cl'n chem. cast bor.	14.33*

BUFFALO

Per gross ton delivered to consumer:

No. 1 hvy. melting	$19.25*
No. 1 bundles	19.25*
No. 2 bundles	19.25*
No. 2 hvy. melting	19.25*
Mach. shop turn.	14.25
Shoveling turn.	16.25*
Cast iron borings	15.25*
Mixed bor. & turn.	14.25*
No. 1 cupola cast	20.00*
Stove plate	19.00*
Low phos. plate	21.75*
Scrap rails	20.75*
Rails 3 ft. & under	22.75*
RR. steel wheels	23.75*
Cast iron car wheels	20.00*
RR. coil & leaf spgs.	23.75*
RR. knuckles & coup.	23.75*
RR. malleable	22.00*
No. 1 busheling	19.25*

CLEVELAND

Per gross ton delivered to consumer:

No. 1 hvy. melting	$19.50*
No. 2 hvy. melting	19.50*
Compressed sheet stl.	19.50*
Drop forge flashings	19.00*
No. 2 bundles	19.50*
Mach. shop turn.	$13.50 to 14.00
Short shovel.	16.50*
No. 1 busheling	19.50*
Steel axle turn.	18.00*
Low phos. billet and bloom crops	23.66*
Cast iron borings	15.50*
Mixed bor. & turn.	14.50*
No. 2 busheling	17.00*
No. 1 machine cast	20.00*
Railroad cast	20.00*
Railroad grate bars	15.25*
Stove plate	19.00*
RR. hvy. melting	20.50*
Rails 3 ft. & under	23.00*
Rails 18 in. & under	24.25*
Rails for rerolling	23.00*
Railroad malleable	22.00*
Elec. furnace punch.	22.00*

SAN FRANCISCO

Per gross ton delivered to consumer:

RR. hvy. melting	$15.50 to $16.25
No. 1 hvy. melting	15.50 to 16.25
No. 2 hvy. melting	14.50 to 15.25
No. 2 bales	13.50 to 14.25
No. 3 bales	9.50 to 10.59
Mach. shop turn.	7.00
Elec. furn. 1 ft., und.	15.50 to 17.00
No. 1 cupola cast	19.00 to 21.00

LOS ANGELES

Per gross ton delivered to consumer:

No. 1 hvy. melting	$14.00 to $15.00
No. 2 hvy. melting	13.00 to 14.00
No. 2 bales	12.00 to 13.00
No. 3 bales	9.00 to 10.00
Mach. shop turn.	4.50
No. 1 cupola cast	19.00 to 21.00

SEATTLE

Per gross ton delivered to consumer:

RR. hvy. melting	$13.50
No. 1 hvy. melting	13.50
No. 3 bundles	11.50
Elec. furn. 1 ft., und.	$16.00 to 17.00
No. 1 cupola cast	20.00*

Comparison of Prices . .

Advances Over Past Week in **Heavy Type;** Declines in *Italics.* Prices are F.O.B. Major Basing Points. The various basing points for finished and semi-finished steel are listed in the detailed price tables, pages 162-170.

Flat Rolled Steel: (Cents Per Lb.)	Feb. 13, 1945	Feb. 6, 1945	Jan. 9, 1945	Feb. 15, 1944
Hot rolled sheets*	2.10	2.10	2.10	2.10
Cold rolled sheets	3.05	3.05	3.05	3.05
Galvanized sheets (24 ga.)*	3.50	3.50	3.50	3.50
Hot rolled strip	2.10	2.10	2.10	2.10
Cold rolled strip	2.80	2.80	2.80	2.80
Plates*	2.10	2.10	2.10	2.10
Plates, wrought iron	3.80	3.80	3.80	3.80
Stain's c.r. strip (No. 302)	28.00	28.00	28.00	28.00
Tin and Terne Plate: (Dollars Per Base Box)				
Tin plate, standard cokes	$5.00	$5.00	$5.00	$5.00
Tin plate, electrolytic	4.50	4.50	4.50	4.50
Special coated mfg. ternes	4.30	4.30	4.30	4.30
Bars and Shapes: (Cents Per Lb.)				
Merchant bars	2.15	2.15	2.15	2.15
Cold finished bars	2.65	2.65	2.65	2.65
Alloy bars	2.70	2.70	2.70	2.70
Structural shapes	2.10	2.10	2.10	2.10
Stainless bars (No. 302)	24.00	24.00	24.00	24.00
Wrought iron bars	4.40	4.40	4.40	4.40
Wire and Wire Products: (Cents Per Lb.)				
Plain wire	2.60	2.60	2.60	2.60
Wire nails*	2.55	2.55	2.55	2.55
Rails: (Dollars Per Gross Ton)				
Heavy rails*	$40.00	$40.00	$40.00	$40.00
Light rails*	40.00	40.00	40.00	40.00
Semi-Finished Steel: (Dollars Per Gross Ton)				
Rerolling billets	$34.00	$34.00	$34.00	$34.00
Sheet bars	34.00	34.00	34.00	34.00
Slabs, rerolling	34.00	34.00	34.00	34.00
Forging billets	40.00	40.00	40.00	40.00
Alloy blooms, billets, slabs	54.00	54.00	54.00	54.00
Wire Rods and Skelp: (Cents Per Lb.)				
Wire rods	2.00	2.00	2.00	2.00
Skelp	1.90	1.90	1.90	1.90

* For interim increase on delivered price granted by OPA as of Jan. 11, 1945, see detailed price tables.

Pig Iron: (Per Gross Ton)	Feb. 13, 1945	Feb. 6, 1945	Jan. 9, 1945	Feb. 15, 1944
No. 2 fdy., Philadelphia	$25.84	$25.84	$25.84	$25.84
No. 2, Valley furnace	24.00	24.00	24.00	24.00
No. 2, Southern Cin'ti	25.11	25.11	25.11	23.94
No. 2, Birmingham	20.38	20.38	20.38	20.38
No. 2, foundry, Chicago†	24.00	24.00	24.00	24.00
Basic, del'd eastern Pa.	25.34	25.34	25.34	25.34
Basic, Valley furnace	23.50	23.50	23.50	23.50
Malleable, Chicago†	24.00	24.00	24.00	24.00
Malleable, Valley	24.00	24.00	24.00	24.00
L. S. charcoal, Chicago	37.34	37.34	37.34	37.34
Ferromanganese‡	135.00	135.00	135.00	135.00

† The switching charge for delivery to foundries in the Chicago district is 60c. per ton.
‡ For carlots at seaboard.

Scrap: (Per Gross Ton)				
Heavy melt'g steel, P'gh.	$20.00	$20.00	$20.00	$20.00
Heavy melt'g steel, Phila.	18.75	18.75	18.75	18.75
Heavy melt'g steel, Ch'go	18.75	18.75	18.75	18.75
No. 1 hy. comp. sheet, Det.	17.32	17.32	17.32	17.85
Low phos. plate, Youngs'n	22.50	22.50	22.25	22.50
No. 1 cast, Pittsburgh	20.00*	20.00*	20.00*	20.00
No. 1 cast, Philadelphia	20.00*	20.00*	20.00*	20.00
No. 1 cast, Chicago	20.00*	20.00*	20.00*	20.00

*F.O.B. shipping point.

Coke, Connellsville: (Per Net Ton at Oven)				
Furnace coke, prompt	$7.00	$7.00	$7.00	$7.00
Foundry coke, prompt	8.25	8.25	8.25	8.25
Non-Ferrous Metals: (Cents Per Lb. to Large Buyers)				
Copper, electro., Conn.	12.00	12.00	12.00	12.00
Copper, Lake	12.00	12.00	12.00	12.00
Tin (Straits), New York	52.00	52.00	52.00	52.00
Zinc, East St. Louis	8.25	8.25	8.25	8.25
Lead, St. Louis	6.35	6.35	6.35	6.35
Aluminum, Virgin, del'd.	15.00	15.00	15.00	15.00
Nickel, electrolytic	35.00	35.00	35.00	35.00
Magnesium, ingot	20.50	20.50	20.50	20.50
Antimony, Laredo, Tex.	14.50	14.50	14.50	14.50

Composite Prices . . .

Starting with the issue of April 22, 1943, the weighted finished steel price index was revised for the years 1941, 1942 and 1943. See explanation of the change on page 90 of the April 22, 1943, issue.

	FINISHED STEEL	PIG IRON	SCRAP STEEL
February 13, 1945	2.25839c. a Lb.	$23.61 a Gross Ton	$19.17 a Gross Ton
One week ago	2.25839c. a Lb.	$23.61 a Gross Ton	$19.17 a Gross Ton
One month ago	2.25839c. a Lb.	$23.61 a Gross Ton	$19.17 a Gross Ton
One year ago	2.27235c. a Lb.	$23.61 a Gross Ton	$19.17 a Gross Ton

	FINISHED STEEL HIGH	FINISHED STEEL LOW	PIG IRON HIGH	PIG IRON LOW	SCRAP STEEL HIGH	SCRAP STEEL LOW
1945	2.25839c., Jan. 16	2.21189c., Jan. 2				
1944	2.30837c., Sept. 5	2.21189c., Oct. 5	$23.61	$23.61	$19.17	$15.67, Oct. 24
1943	2.25513c.	2.25513c.	23.61	23.61	19.17	19.17
1942	2.26190c.	2.26190c.	23.61	23.61	19.17	19.17
1941	2.43078c.	2.43078c.	$23.61, Mar. 20	$23.45, Jan. 2	$22.00, Jan. 7	$19.17, Apr. 10
1940	2.30467c., Jan. 2	2.24107c., Apr. 16	23.45, Dec. 23	22.61, Jan. 2	21.83, Dec. 30	16.04, Apr. 9
1939	2.35367c., Jan. 3	2.26689c., May 16	22.61, Sept. 19	20.61, Sept. 12	22.50, Oct. 3	14.08, May 16
1938	2.58414c., Jan. 4	2.27207c., Oct. 18	23.25, June 21	19.61, July 6	15.00, Nov. 22	11.00, June 7
1937	2.58414c., Mar. 9	2.32263c., Jan. 4	23.25, Mar. 9	20.25, Feb. 16	21.92, Mar. 30	12.67, June 8
1936	2.32263c., Dec. 28	2.05200c., Mar. 10	19.74, Nov. 24	18.73, Aug. 11	17.75, Dec. 21	12.67, June 9
1935	2.07642c., Oct. 1	2.06492c., Jan. 8	18.84, Nov. 5	17.83, May 14	13.42, Dec. 10	10.33, Apr. 29
1934	2.15367c., Apr. 24	1.95757c., Jan. 2	17.90, May 1	16.90, Jan. 27	13.00, Mar. 13	9.50, Sept. 25
1933	1.95578c., Oct. 3	1.75836c., May 2	16.90, Dec. 5	13.56, Jan. 3	12.25, Aug. 8	6.75, Jan. 3
1932	1.89196c., July 5	1.83901c. Mar. 1	14.81, Jan. 5	13.56, Dec. 6	8.50, Jan. 12	6.43, July 5
1931	1.99626c., Jan. 13	1.86586c., Dec. 29	15.90, Jan. 6	14.79, Dec. 15	11.33, Jan. 6	8.50, Dec. 29
1930	2.25488c., Jan. 7	1.97319c., Dec. 9	18.21, Jan. 7	15.90, Dec. 16	15.00, Feb. 18	11.25, Dec. 9
1929	2.31773c., May 28	2.26498c., Oct. 29	18.71, May 14	18.21, Dec. 17	17.58, Jan. 29	14.08, Dec. 3

Weighted index based on steel bars, shapes, plates, wire, rails, black pipe, hot and cold-rolled sheets and strip, representing 78 per cent of the United States output. Index recapitulated in Aug. 28, 1941, issue.

Based on averages for basic iron at Valley furnaces and foundry iron at Chicago, Philadelphia, Buffalo, Valley and Southern iron at Cincinnati.

Based on No. 1 heavy melting steel scrap quotations to consumers at Pittsburgh, Philadelphia and Chicago.

HOW THE AIRLESS WHEELABRATOR *Slashes* CLEANING TIME

Your blast cleaning problems may present a mountain size obstacle to you . . . but you can make them vanish into mole hills by calling on American's experience. There is convincing proof in the history of thousands of cleaning applications handled by the Airless Wheelabrator that this method is earning its way by effecting unusual reductions in cleaning time, cost, manpower, and space. Check over this "fact chart" from performance reports and you can see why "In number of machines sold and variety of applications handled American leads the field."

COMPANY AND LOCATION	PRODUCT	QUANTITY OR WEIGHT	FORMER METHOD		Wheelabrator Method
			EQUIPMENT	TIME	TIME
yman Gordon Co., Worcester, Mass.	Aircraft crankshafts	550 lbs.	Pickling	30 min.	2 min.
tanley G. Flagg Co., Stowe, Pa.	Pipe caps	1900 lbs.	Airblast barrel	18 min.	4 min.
merican Crucible Products Co., Lorain, Ohio	Brass castings		Airblast barrel	18 hours	3 hours
etroit Diesel Eng. Div., Detroit, Mich.	Diesel engine parts	250 parts	Suction cabinet	5 hours	5 min.
igh Standard Mfg. Co., Hamden, Conn.	Rifle parts	26,522 lbs.	Airblast barrel	60 hours	16 hours
eneral Railway Switch Co., Rochester, N. Y.	Machine gun bases	35 bases	Airblast tables	3 hours	18 min.
ontinental Motors Corp., Detroit, Mich.	Cylinder barrels		Airblast table	24 hours	3-5 hours
enry Disston & Sons, Philadelphia, Pa.	Armorplate		Airblast room	3 hours	1 hour
hn Inglis Co., Ltd., Toronto, Ontario	Heat-treated parts	6000 parts	Tumbling mills	24 hours	15 min.
enjamin Eastwood Co., Paterson, N. J.	Gray iron castings		Airblast barrel	1 hour	6 min.
. Belfield Co., Philadelphia, Pa.	Valve bodies		Wire brushes	8 hours	1½ hours
ood Bros. Thresher Co., Des Moines, Iowa	Tank doors	12 doors	Airblast table	6 hours	1 hour
ontiac Foundry & Mach. Co., Pontiac, Mich.	Gear blanks		Tumbling barrels	11 hours	3½ hours
cello Corp., Detroit, Mich.	H. T. engine parts	9000 parts	Airblast barrels	2 hours	10 min.
merican Steel & Wire Co., Worcester, Mass.	Gun forgings	150 pieces	Airblast cabinet	15 hours	10 min.
orn Manganese Bronze Corp., Brooklyn, New York	Brass & bronze castings		Wet tumbling barrel	40 min.	5 min.
ternational Silver Co., Meriden, Conn.	Garand rifle parts	2000 parts	Tumbling barrels	4-8 hours	8-10 min.
ick Aviation, Melrose Park, Ill.	Heat treated gears	56 gears		3 hours	15 min.
estinghouse Elec. & Mfg. Co., E. Pittsburgh, Pa.	Malleable iron caps	160 caps	Airblast cabinet	1½ days	16 min.
perior Castings Corp., South Norwalk, Conn.	Tanks and covers	8-14 pieces	Airblast cabinet	25 min.	4 min.
nadian Bronze Co., Ltd., Montreal, Quebec	Journal bearings	75 bearings	Sand blast room	30 min.	4 min.
ach Foundry Co., Ottawa, Ontario	Bomb nose plugs	1000 plugs	Tumbling barrel	3 hours	15 min.
le & Towne Mfg. Co., Stamford, Conn.	Trolley gears	54 gears	Table	5 hours	13 min.
Wilcox Company, Mechanicsburg, Pa.	Annealed forgings	200 pieces	Sand blast barrel	4 hours	12 min.

American
FOUNDRY EQUIPMENT CO.
510 SOUTH BYRKIT STREET MISHAWAKA, INDIANA

WORLD'S LARGEST BUILDERS OF AIRLESS BLAST EQUIPMENT

Prices of Finished Iron and Steel . . .

Steel prices shown here are f.o.b. basing points, in cents per lb. unless otherwise indicated. Extras apply. Delivered prices do not reflect 3% tax on freight. (1) Mill run sheet, 10c. per 100 lb. under base; primes, 25c. above base. (2) Unassorted 8-lb. coating. (3) Widths up to 12-in.. (4) 0.25 carbon and less. (5) Applies to certain width and length limitations. (6) For merchant trade. (7) For straight length material only from producer to consumer. Discount of 25c. per 100 lb. to fabricators. (8) Also shafting. For quantities of 20,000 to 29,999 lb. (9) Carload lot in manufacturing trade. (10) Prices do not apply if rail and water is not used. (12) Boxed. (13) Portland and Seattle price, San Francisco 2.50c. (14) This base price for annealed, bright finish wires, commercial spring wire. (15) Add 10c. per 100 lb. to delivered price—OPA interim increase, Jan. 11, 1945. (16) Add 15c. per 100 lb. to delivered price—OPA interim increase, Jan. 11, 1945. (17) Add 10c. per 100 lb. to delivered price of plates produced to sheared mill or universal mill width and length tolerances—OPA interim increase, Jan. 11, 1945.

Basing Point → / Product ↓	Pittsburgh	Chicago	Gary	Cleveland	Birmingham	Buffalo	Youngstown	Sparrows Point	Granite City	Middletown, Ohio	Gulf Ports, Cars	Pacific Ports, Cars [10]	DELIVERED TO Detroit	New York	Philadelphia
SHEETS															
Hot rolled [15]	2.10¢	2.10¢	2.10¢	2.10¢	2.10¢	2.10¢	2.10¢	2.10¢	2.20¢	2.10¢		2.65¢	2.20¢	2.34¢	2.27¢
Cold rolled [1]	3.05¢	3.05¢	3.05¢	3.05¢		3.05¢	3.05¢		3.15¢	3.05¢		3.70¢	3.15¢	3.39¢	3.37¢
Galvanized (24 gage) [16]	3.50¢	3.50¢	3.50¢		3.50¢	3.50¢	3.50¢	3.50¢	3.60¢	3.50¢		4.05¢		3.74¢	3.67¢
Enameling (20 gage)	3.35¢	3.35¢	3.35¢	3.35¢			3.35¢		3.45¢	3.35¢		4.00¢	3.45¢	3.71¢	3.67¢
Long ternes [2]	3.80¢	3.80¢	3.80¢									4.55¢		4.16¢	4.12¢
STRIP															
Hot rolled [3]	2.10¢	2.10¢	2.10¢	2.10¢	2.10¢		2.10¢			2.10¢		2.75¢	2.20¢	2.46¢	
Cold rolled [4]	2.80¢	2.90¢		2.80¢			2.80¢	(Worcester=3.00¢)					2.90¢	3.16¢	
Cooperage stock	2.20¢	2.20¢			2.20¢		2.20¢							2.56¢	
Commodity C-R	2.95¢	3.05¢		2.95¢			2.95¢	(Worcester=3.35¢)					3.05¢	3.31¢	
TIN PLATE															
Standard cokes, base box	$5.00	$5.00	$5.00						$5.10					5.36¢	5.32¢
Electro, box 0.25 lb.	$4.35	$4.35	$4.35												
Electro, box 0.50 lb.	$4.50	$4.50	$4.50						$4.60						
Electro, box 0.75 lb.	$4.65		$4.65						$4.75						
BLACK PLATE															
29 gage [5]	3.05¢	3.05¢	3.05¢						3.15¢			4.05¢[12]			3.37¢
TERNES, MFG.															
Special coated, base box	$4.30	$4.30	$4.30						$4.40						
BARS															
Carbon steel	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢		(Duluth=2.25¢)			2.50¢	2.80¢	2.25¢	2.49¢	2.47¢
Rail steel [6]	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢					2.50¢	2.80¢			
Reinforcing (billet) [7]	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢			2.50¢	2.55¢[13]	2.25¢	2.39¢	
Reinforcing (rail) [7]	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢				2.50¢	2.55¢[13]	2.25¢		2.47¢
Cold finished [8]	2.65¢	2.65¢	2.65¢	2.65¢		2.65¢		(Detroit=2.70¢)			(Toledo=2.80¢)			2.99¢	2.97¢
Alloy, hot rolled	2.70¢	2.70¢				2.70¢		(Bethlehem, Massillon, Canton=2.70¢)					2.80¢		
Alloy, cold drawn	3.35¢	3.35¢	3.35¢	3.35¢		3.35¢							3.45¢		
PLATES								(Coatesville and Claymont=2.10¢)							
Carbon steel [17]	2.10¢	2.10¢	2.10¢	2.10¢	2.10¢		2.10¢	2.10¢	2.35¢		2.45¢	2.65¢	2.32¢	2.29¢	2.15¢
Floor plates	3.35¢	3.35¢									3.70¢	4.00¢		3.71¢	3.67¢
Alloy	3.50¢	3.50¢			(Coatesville=3.50¢)						3.95¢	4.15¢		3.70¢	3.59¢
SHAPES															
Structural	2.10¢	2.10¢	2.10¢		2.10¢	2.10¢		(Bethlehem=2.10¢)			2.45¢	2.75¢		2.27¢	2.215¢
SPRING STEEL, C-R															
0.26 to 0.50 Carbon	2.80¢			2.80¢				(Worcester=3.00¢)							
0.51 to 0.75 Carbon	4.30¢			4.30¢				(Worcester=4.50¢)							
0.76 to 1.00 Carbon	6.15¢			6.15¢				(Worcester=6.35¢)							
1.01 to 1.25 Carbon	8.35¢			8.35¢				(Worcester=8.55¢)							
WIRE [9]															
Bright [14]	2.60¢	2.60¢		2.60¢	2.60¢			(Worcester=2.70¢)		(Duluth=2.65¢)		3.10¢			2.92¢
Galvanized	Add proper size extra and galvanizing extra to Bright Wire base														
Spring (High Carbon)	3.20¢	3.20¢		3.20¢				(Worcester=3.30¢)				3.70¢			3.52¢
PILING															
Steel Sheet	2.40¢	2.40¢				2.40¢						2.95¢			2.72¢

EXCEPTIONS TO PRICE SCHED. NO. 6.

Slabs—Andrews Steel Co. $41 basing pts.; Wheeling Steel Corp. (rerolling) 4 in. sq. or larger $37.75 f.o.b. Portsmouth, Ohio; Empire Sheet & Tin Plate Corp. $41; Phoenix Iron Co. (rerolling) $41, (forging) $47; Granite City Steel $47.50; Kaiser Co. rerolling $58.64, (forging) $64.64, f.o.b. Los Angeles.

Blooms—Phoenix Iron Co. (rerolling) $41; (forging) $47; Pgh. Steel Co. (rerolling) $38.25, (forging) $44.25; Wheeling Steel Corp. (rerolling) 4 in. sq. or larger $37.75 f.o.b. Portsmouth; Kaiser Co. (rerolling) $58.64, (forging) $64.64, (shell steel) $74.64 f.o.b. Los Angeles.

Sheet bar—Empire Sheet & Tin Plate Co. $39 mill; Wheeling Steel Corp. $38 Portsmouth, Ohio.

Billets, Forging—Andrews Steel Co. $50 basing pts.; Follansbee Steel Corp. $49.50 Toronto, Ohio; Phoenix Iron Co. $47 mill; Geneva Steel Co. $64.64 f.o.b. Pacific Coast; Pittsburgh Steel Co. $49.50; Kaiser Co. $64.64, (shell steel) $74.64, f.o.b. Los Angeles.

Billets, Rerolling—Continental Steel Corp. may charge Acme Steel in Chicago switching area $34 plus freight from Kokomo, Ind.; Northwestern Steel & Wire Co. (Lend-Lease) $41 mill; Wheeling Steel Corp. 4 in. sq. or larger $37.75, smaller $39.50 f.o.b. Portsmouth, Ohio; Stanley Works may sell Washburn Wire Co. under allocation at $39 Bridgeport, Conn.; Keystone Steel & Wire Co. may sell Acme Steel Co. at Chicago base, f.o.b. Peoria; Phoenix Iron Co. $41 mill; Continen-

PRICES

tal Steel Corp. (1¾ x 1¾) $39.50, (2 x 2) $40.60 Kokomo, Ind. (these prices include $1 size extra); Keystone Steel & Wire Co. $36.40 Peoria; Connors Steel Co. $50.60 Birmingham; Ford Motor Co. $34 Dearborn, Mich.; Geneva Steel Co. $58.64 f.o.b. Pacific Coast; Pgh. Steel Co. $43.50; Kaiser Co. $58.64 f.o.b. Los Angeles.

Structural Shapes—Phoenix Iron Co. $2.35 basing pts. (export) $2.50 Phoenixville; Knoxville Iron Co. $2.30 basing points; Kaiser Co. $3.20 f.o.b. Los Angeles.

Rails—Sweet Steel Co. (rail steel) $50 mill; West Virginia Rail Co. (lightweight) on allocation based Huntington, W. Va.; Colorado Fuel & Iron Corp., $45 Pueblo.

Hot Rolled Plate—Granite City Steel Co. $2.65 mill; Knoxville Iron Co. $2.25 basing pts.; Kaiser Co. and Geneva Steel Co. $3.20 Pacific Ports; Central Iron and Steel Co. $2.50 basing points; Granite City Steel Co. $2.35 Granite City.

Merchant Bars—W. Ames Co., 10 tons and over, $2.85 mill; Eckels-Nye Steel Corp. $2.50 basing pts. (rail steel) $2.40; Phoenix Iron Co. $2.40 basing pts.; Sweet Steel Co. (rail steel) $2.35 mill; Joslyn Mfg. & Supply Co., $2.35 Chicago; Calumet Steel Div., Borg Warner Corp. (8 in. mill bar), $2.35 Chicago; Knoxville Iron Co., $2.30 basing pts.; Laclede Steel Co., sales to LaSalle Steel granted Chicago base, f.o.b. Madison, Ill.; Milton Mfg. Co., $2.75 f.o.b. Milton, Pa.

Pipe Skelp—Wheeling Steel Corp., Benwood, $2.05 per 100 lb.

Reinforcing Bars—W. Ames & Co., 10 tons and over, $2.85 mill; Sweet Steel Co. (rail steel), $2.35 mill; Columbia Steel Co., $2.50 Pacific Ports.

Cold Finished Bars—Keystone Drawn Steel Co. on allocation, Pittsburgh c.f. base plus c/l freight on hot rolled bars Pittsburgh to Spring City, Pa.; New England Drawn Steel Co. on allocation outside New England, Buffalo c.f. base plus c/l freight Buffalo to Mansfield, Mass., f.o.b. Mansfield; Empire Finished Steel Corp. on allocation outside New England, Buffalo c.f. base plus c/l freight Buffalo to plants f.o.b. plant; Compressed Steel Shafting Co. on allocation outside New England, Buffalo base plus c/l freight Buffalo to Readville, Mass. f.o.b. Readville; Medart Co. in certain areas, Chicago c.f. base plus c/l freight Chicago to St. Louis, f.o.b. St. Louis.

Alloy Bars—Texas Steel Co., for delivery except Texas and Okla., Chicago base, f.o.b. Fort Worth, Tex.; Conors Steel Co., shipped outside Ala., Mississippi, Louisiana, Georgia, Florida, Tenn., Pittsburgh base, f.o.b. Birmingham.

Hot Rolled Strip—Joslyn Mfg. & Supply Co., $2.30 Chicago; Knoxville Iron Co., $2.25 basing pts.

Hot Rolled Sheets—Andrews Steel Co., Middletown base on shipments to Detroit or area; Parkersburg Iron & Steel Co., $2.25 Parkersburg.

Galvanized Sheets—Andrews Steel Co., $3.75 basing pts.; Parkersburg Iron & Steel Co., $3.85 Parkersburg; Apollo Steel Co., $3.75 basing pts.; Continental Steel Co., Middletown base on Kokomo, Ind., product; Superior Sheet Steel Co., Pittsburgh base except for Lend-Lease.

Pipe and Tubing—South Chester Tube Co. when priced at Pittsburgh, freight to Gulf Coast and Pacific Ports may be charged from Chester, Pa., also to points lying west of Harrisburg, Pa.

Black Sheets—Empire Sheet and Tinplate Co., maximum base price mill is $2.45 per 100 lb., with differentials, transportation charges, etc., provided in RPS. No. 6.

Wire Products—Pittsburgh Steel Co., f.o.b. Pittsburgh, per 100 lb., rods, No. 5 to 9/32 in., $2.20; rods, heavier than 9/32, $2.35; bright wire, $2.725; bright nails, $2.90; lead and furnace annealed wire, $2.85; pot annealed wire, $2.85; galvanized barbed wire, $3.90; plain staples, $2.55; galvanized staples, $2.65; bright spring wire, $3.30; galvanized spring wire, $3.45.

WAREHOUSE PRICES

Delivered metropolitan areas per 100 lb. These are zoned warehouse prices in conformance with latest zoning amendment to OPA Price Schedule 49.

Cities	SHEETS			STRIP		Plates ¼ in. and heavier	Structural Shapes	BARS		ALLOY BARS			
	Hot Rolled (10 gage)	Cold Rolled	Galvanized (24 gage)	Hot Rolled	Cold Rolled			Hot Rolled	Cold Finished	Hot Rolled, NE 8617-20	Hot Rolled, NE 9442-45 Ann.	Cold Drawn, NE 8617-20	Cold Drawn, NE 9442-45 Ann.
**Philadelphia	3.518	4.872[8]	5.018a	3.922	4.772	3.605	3.666	3.822	4.072	5.966	7.066	7.272	8.322
New York	3.590	4.613[3]	5.010	3.974[6]	4.772	3.768	3.758	3.853	4.103	6.008	7.108	7.303	8.353
Boston	3.744	4.744[9]	5.224[9]	4.106	4.715	3.912	3.912	4.044	4.144	6.162	7.262	7.344	8.394
Baltimore	3.394	4.852	4.894	3.902	4.752	3.594	3.759	3.802	4.052	....	....	....	....
Norfolk	3.771	4.965	5.371	4.165	4.865	3.971	4.002	4.065	4.165	....	....	....	....
Chicago	3.25	4.20	5.231	3.60	4.65[17]	3.55	3.55	3.50	3.75	5.75	6.85	6.85	7.90
Milwaukee	3.387	4.337[3]	5.272[4]	3.737	4.787[17]	3.687	3.687	3.637	3.887	5.887	7.087	7.087	8.137
Cleveland	3.35	4.40	4.877[4]	3.60	4.45	3.40	3.588	3.35	3.75	5.956	7.056	6.85	7.90
Buffalo	3.35	4.40	4.75[4]	3.819	4.669	3.63	3.40	3.35	3.75	5.75	6.85	6.85	7.90
Detroit	3.45	4.50	5.00[4]	3.70	4.659[17]	3.609	3.681	3.45	3.80	6.08	7.18	7.159	8.209
Cincinnati	3.425	4.475[3]	4.825[5]	3.675	4.711	3.611	3.691	3.611	4.011	....	....	....	....
St. Louis	3.397	4.347[3]	5.172[4]	3.747	4.931[17]	3.697	3.697	3.647	4.031	6.131	7.231	7.231	8.281
Pittsburgh	3.35	4.40	4.75	3.60	4.45	3.40	3.40	3.35	3.75	5.75	6.85	8.85	7.90
St. Paul	3.51	4.48	5.257[4]	3.86	4.35[17]	3.813[3]	3.813[3]	3.763[3]	4.361	6.09	7.19	7.561	8.711
Omaha	3.865	5.443	5.608[4]	4.215	....	4.165	4.165	4.115	4.43	....	....	....	....
Indianapolis	3.58	3.58	4.568	4.918	3.768	4.78	3.63	3.58	3.98	6.08	7.18	7.18	8.23
Birmingham	3.45	....	4.75	3.70	....	3.55	3.55	3.50	4.43	....	....	....	....
Memphis	3.965[7]	4.66	3.265	4.215	....	4.065	4.065	4.015	4.33	....	....	....	....
New Orleans	4.058*	4.95	5.358	4.308	....	4.158	4.158*	4.108*	4.629	....	....	....	....
Houston	3.763	5.573	6.313[1]	4.313	....	4.25	4.25	3.75	6.373[3]	7.223	8.323	8.323	9.373
Los Angeles	5.00	7.20[3]	6.10[4]	4.95	5.613[15]	4.95	4.65	4.40	5.583	8.304	9.404	9.404	10.454
San Francisco	4.55[14]	7.30[4]	6.35[4]	4.50[14]	7.333[17]	4.65[14]	4.35[14]	4.15[14]	5.333	8.304	9.404	9.404	10.454
Seattle	4.65[12]	7.05[4]	5.95[4]	4.25[12]	....	4.75[12]	4.45[12]	4.35[12]	5.783	....	9.404	....	....
Portland	4.65[11]	6.80[4]	5.75[4]	4.75[11]	....	4.75[11]	4.45[11]	4.45[11]	5.533	8.304	9.404	8.304	9.404
Salt Lake City	4.53[17]	....	6.17[18]	5.53[17]	....	4.98[17]	4.98[17]	4.88[17]	5.90	....	....	....	....

National Emergency Steels

MILL EXTRAS

Designation	Basic Open-Hearth		Electric Furnace		Designation	Basic Open-Hearth		Electric Furnace	
	Bars and Bar-Strip	Billets, Blooms, and Slabs	Bars and Bar-Strip	Billets, Blooms, and Slabs		Bars and Bar-Strip	Billets, Blooms, and Slabs	Bars and Bar-Strip	Billets, Blooms, and Slabs
NE 8612	0.65¢	$13.00	$1.15	$23.00	NE 9427	0.75	15.00	1.25	25.00
NE 8615	0.65	13.00	1.15	23.00	NE 9430	0.75	15.00	1.25	25.00
NE 8617	0.65	13.00	1.15	23.00	NE 9432	0.75	15.00	1.25	25.00
NE 8620	0.65	13.00	1.15	23.00	NE 9435	0.75	15.00	1.25	25.00
NE 8622	0.65	13.00	1.15	23.00	NE 9437	0.75	15.00	1.25	25.00
NE 8625	0.65	13.00	1.15	23.00	NE 9440	0.75	15.00	1.25	25.00
NE 8627	0.65	13.00	1.15	23.00	NE 9442	0.80	16.00	1.30	26.00
NE 8630	0.65	13.00	1.15	23.00	NE 9445	0.80	16.00	1.30	26.00
NE 8632	0.65	13.00	1.15	23.00	NE 9447	0.80	16.00	1.30	26.00
NE 8635	0.65	13.00	1.15	23.00	NE 9450	0.80	16.00	1.30	26.00
NE 8637	0.65	13.00	1.15	23.00					
NE 8640	0.65	13.00	1.15	23.00					
NE 8642	0.65	13.00	1.15	23.00	NE 9722	0.65¢	$13.00	$1.15	$23.00
NE 8645	0.65	13.00	1.15	23.00	NE 9727	0.65	13.00	1.15	23.00
NE 8647	0.65	13.00	1.15	23.00	NE 9732	0.65	13.00	1.15	23.00
NE 8650	0.65	13.00	1.15	23.00	NE 9737	0.65	13.00	1.15	23.00
					NE 9742	0.65	13.00	1.15	23.00
					NE 9745	0.65	13.00	1.15	23.00
NE 8712	0.70¢	$14.00	$1.20	$24.00	NE 9747	0.65	13.00	1.15	23.00
NE 8715	0.70	14.00	1.20	24.00	NE 9750	0.65	13.00	1.15	23.00
NE 8717	0.70	14.00	1.20	24.00	NE 9763	0.65	13.00	1.15	23.00
NE 8720	0.70	14.00	1.20	24.00	NE 9768	0.65	13.00	1.15	23.00
NE 8722	0.70	14.00	1.20	24.00					
NE 8725	0.70	14.00	1.20	24.00					
NE 8727	0.70	14.00	1.20	24.00	NE 9830	$1.30	$26.00	$1.80	$36.00
NE 8730	0.70	14.00	1.20	24.00	NE 9832	1.30	26.00	1.80	36.00
NE 8732	0.70	14.00	1.20	24.00	NE 9935	1.30	26.00	1.80	36.00
NE 8735	0.70	14.00	1.20	24.00	NE 9837	1.30	26.00	1.80	36.00
NE 8737	0.70	14.00	1.20	24.00	NE 9840	1.30	26.00	1.80	36.00
NE 8740	0.70	14.00	1.20	24.00	NE 9842	1.30	26.00	1.80	36.00
NE 8742	0.70	14.00	1.20	24.00	NE 9845	1.30	26.00	1.80	36.00
NE 8745	0.70	14.00	1.20	24.00	NE 9847	1.30	26.00	1.80	36.00
NE 8747	0.70	14.00	1.20	24.00	NE 9850	1.30	26.00	1.80	36.00
NE 8750	0.70	14.00	1.20	24.00					
					NE 9912	$1.20	$24.00	$1.55	$31.00
NE 9415	0.75¢	$15.00	$1.25	$25.00	NE 9915	1.20	24.00	1.55	31.00
NE 9417	0.75	15.00	1.25	25.00	NE 9917	1.20	24.00	1.55	31.00
NE 9420	0.75	15.00	1.25	25.00	NE 9920	1.20	24.00	1.55	31.00
NE 9422	0.75	15.00	1.25	25.00	NE 9922	1.20	24.00	1.55	31.00
NE 9425	0.75	15.00	1.25	25.00	NE 9925	1.20	24.00	1.55	31.00

Note 1: The ranges shown are restricted to sizes 100 sq. in. or less or equivalent cross-sectional area 18 in. wide or under, with a maximum individual piece weight of 7000 lb. irrespective of size. **Note 2:** For steels ordered to such ranges, below the size and weight restriction, the average of all the chemical checks must be within the limits specified subject to check analysis variations given in Table 4, Section 10, A.I.S.I. Steel Products Manual. **Note 3:** When acid open-hearth is specified and acceptable, add to basic open-hearth alloy differential 0.25c. per lb. for bars and bar strip and $5 per gross ton for billets, blooms and slabs. **Note 4:** The extras shown are in addition to the base price of $2.70 for 100 lb. on finished products and $54 per gross ton on semi-finished steel, major basing points, and are in cents per pound when applicable to bars and bar-strip and in dollars per gross ton when applicable to billets, blooms and slabs. The full extra applicable over the base price is the total of all extras indicated by the specific requirements of the order. The higher extra shall be charged for any size falling between two published extras.

BASE QUANTITIES

Standard unless otherwise keyed on prices.

HOT ROLLED: Sheets, strip, plates, shapes and bars, 400 to 1999 lb.

COLD ROLLED: Sheets, 400 to 1499 lb.; strip, extras on all quantities; bars, 1500 lb. base; NE alloy bars, 1000 to 39,999 lb.

EXCEPTIONS: (1) 150 to 499 lb. (2) 150 to 1499 lb. (3) 400 to 1499 lb. (4) 450 to 1499 lb. (5) 500 to 1499 lb. (6) 0 to 1999 lb. (7) 400 to 1999 lb. (8) 1000 to 1999 lb. (9) 450 to 3749 lb. (10) 400 to 3999 lb. (11) 300 to 4999 lb. (12) 300 to 10,000 lb. (13) 400 to 14,999 lb. (14) 400 lb. and over. (15) 1000 lb. and over. (16) 1500 lb. and over. (17) 2000 lb. and over. (18) 3500 lb. and over.

(*) Philadelphia: Galvanized sheet, 25 or more bundles.

Extra for size, quality, etc., apply on above quotations.

*Add 0.271c. for sizes not rolled in Birmingham.

**City of Philadelphia only. Applicable freight rates must be added to basing point prices to obtain delivered price to other localities in metropolitan area.

LAKE SUPERIOR ORES

(51.50% *Fe, Natural Content, Delivered Lower Lake Ports**)

	Per Gross Ton
Old range, bessemer, 51.50	$4.75
Old range, non-bessemer, 51.50	4.60
Mesaba, bessemer, 51.50	4.60
Mesaba, non-bessemer, 51.50	4.45
High phosphorus, 51.50	4.35

*Adjustments are made to indicate prices based on variance of Fe content of ores as analyzed on a dry basis by independent laboratories.

FLUORSPAR

Maximum price f.o.b. consumer's plant, $30 per short ton plus either (1) rail freight from producer to consumer, or (2) rail freight from Rosiclare, Ill., to consumer, whichever is lower.

Exception

When the WPB Steel Division certifies in writing the consumer's need for one of the higher grades of metallurgical fluorspar specified in the table below the price shall be taken from the table plus items (1 and 2) from paragraph above.

Effective CaF_2 Content:	*Base price per short ton*
70% or more	$33.00
65% but less than 70%	32.00
60% but less than 65%	31.00
Less than 60%	30.00

PRICES

SEMI-FINISHED STEEL

Ingots, Carbon, Rerolling

Base per gross ton, f.o.b. mill.... $31.00

Exceptions: Phoenix Iron Co. may charge $38.75; Kaiser Co., $43.00 f.o.b. Pacific Coast ports; Empire Sheet & Tinplate Co., $34.25; Pgh. Steel Co., $33.10.

Ingots, Carbon, Forging

Base per gross ton, f.o.b. Birmingham, Buffalo, Chicago, Cleveland, Gary, Pittsburgh, Youngstown $36.00

Exceptions: Phoenix Iron Co. may charge $43.00; Empire Sheet & Tinplate Co., $39.25, f.o.b. Mansfield, Ohio; West Coast producers, $48.00, f.o.b. Pacific Coast Ports; Pgh. Steel Co., $38.10.

Ingots, Alloy

Base per gross ton, f.o.b. Bethlehem, Buffalo, Canton, Coatesville, Chicago, Massillon, Pittsburgh $45.00

Exceptions: C/L delivered Detroit add $2.00; delivered East Michigan add $3.00. Connors Steel Co may charge $45.00 f.o.b. Birmingham.

Billets, Blooms and Slabs

Pittsburgh, Chicago, Gary, Cleveland, Youngstown, Buffalo, Birmingham, Sparrows Point (rerolling only). Prices delivered Detroit are $2.00 higher; delivered E. Michigan, $3 higher; f.o.b. Duluth, billets only, $2.00 higher; billets f.o.b. Pacific ports are $12 higher. Provo, $11.20 higher. Delivered prices do not reflect three per cent tax on freight rates.

Per Gross Ton

Rerolling $34.00
Forging quality 40.00

For exceptions on semi-finished steel see the footnote on the page of finished steel prices.

Alloy Billets, Blooms, Slabs

Pittsburgh, Chicago, Canton, Massillon, Buffalo or Bethlehem, per gross ton $54.00

Price delivered Detroit $2.00 higher; E. Michigan, $3.00 higher.

Shell Steel

Per Gross Ton

3 in. to 12 in. $52.00
12 in. to 18 in. 54.00
18 in. and over 56.00

Basic open hearth shell steel, f.o.b. Pittsburgh, Chicago, Buffalo, Gary, Cleveland, Youngstown and Birmingham.

Prices delivered Detroit are $2.00 higher; E. Michigan, $3 higher.

Price Exception: Follansbee Steel Corp. permitted to sell at $13.00 per gross ton, f.o.b. Toronto, Ohio, above base price of $52.00.

Note: The above base prices apply on lots of 1000 tons of a size and section to which are to be added extras for chemical requirements, cutting, or quantity.

Sheet Bars

Pittsburgh, Chicago, Cleveland, Youngstown, Buffalo, Canton, Sparrows Point.

Per Gross Ton

Open hearth or bessemer $34.00

Skelp

Pittsburgh, Chicago, Youngstown, Coatesville, Pa., Sparrows Point, Md.

Per Lb.

Grooved, universal and sheared .. 1.90c.

Wire Rods

(No. 5 to 9/32 in.)

Per Lb.

Pittsburgh, Chicago, Cleveland ... 2.00c.
Worcester, Mass. ..... 2.10c.
Birmingham ..... 2.00c.
San Francisco ..... 2.50c.
Galveston ..... 2.25c.

9/32 in. to 47/64 in., 0.15c. a lb. higher. Quantity extras apply.

TOOL STEEL

(F.o.b. Pittsburgh, Bethlehem, Syracuse)

Base per lb.

High speed ..... 67c.
Straight molybdenum ..... 54c.
Tungsten-molybdenum ..... 57½c.
High-carbon-chromium ..... 43c.
Oil hardening ..... 24c.
Special carbon ..... 22c.
Extra carbon ..... 18c.
Regular carbon ..... 14c.

Warehouse prices east of Mississippi are 2c. a lb. higher; west of Mississippi 3c. higher.

PRICES

WELDED PIPE AND TUBING

Base Discounts, f.o.b. Pittsburgh Distric and Lorain, Ohio, Mills

(F.o.b. Pittsburgh only on wrought pipe) Base Price—$200.00 per Net Ton

	Black	Gal
Steel (Butt Weld)		
½ in.	63½	51
¾ in.	66½	55
1 to 3 in.	68½	57½
Wrought Iron (Butt Weld)		
½ in.	24	3½
¾ in.	30	10
1 and 1¼ in.	34	16
1½ in.	38	18½
2 in	37½	18
Steel (Lap Weld)		
2 in.	61	49½
2½ in and 3 in.	64	52½
3½ to 6 in.	66	54½
Wrought Iron (Lap Weld)		
2 in.	30½	12
2½ to 3½ in.	31½	14½
4 in.	33½	18
4½ to 8 in.	32½	17
Steel (Butt, extra strong, plain ends)		
½ in.	61½	50½
¾ in.	65½	54½
1 to 3 in.	67	57
Wrought Iron (Same as Above)		
½ in.	25	6
¾ in.	31	12
1 to 2 in.	38	19½
Steel (Lap, extra strong, plain ends)		
2 in.	59	43½
2½ and 3 in.	63	52½
3½ to 6 in.	66½	56
Wrought Iron (Same as Above)		
2 in.	33½	15½
2½ to 4 in.	39	22½
4½ to 6 in.	37½	21

On butt weld and lap weld steel pip jobbers are granted a discount of 5%. O less-than-carload shipments prices a determined by adding 25 and 30% an the carload freight rate to the base car

F.o.b. Gary prices are two points low discount or $4 a ton higher than Pitt burgh or Lorain on lap weld and o point lower discount, or $2 a ton high on all butt weld.

CAST IRON WATER PIPE

Per Net To

6-in. and larger, del'd Chicago ...$54.
6-in. and larger, del'd New York.. 52.
6-in. and larger, Birmingham .... 46.
6-in. and larger f.o.b. cars, San Francisco or Los Angeles ..... 69.
6-in. and larger f.o.b. cars, Seattle.. 71.

Class "A" and gas pipe, $3 extra; 4- pipe is $3 a ton above 6-in. Prices show are for lots of less than 200 tons. F 200 tons or over, 6-in. and larger a $45 at Birmingham and $53.80 deliver Chicago, $59.40 at San Francisco a Los Angeles, and $70.20 at Seattle. D livered prices do not reflect new 3 p cent tax on freight rates.

BOILER TUBES

Seamless Steel and Lap Weld Commerc Boiler Tubes and Locomotive Tub Minimum Wall. Net base prices per ft. f.o.b. Pittsburgh, in carload lots.

	Seamless Cold Drawn	Hot Rolled	We Ro
2 in. o.d. 13 B.W.G.	15.03	13.04	12.
2½ in. o.d. 12 B.W.G.	20.21	17.54	16.
3 in. o.d. 12 B.W.G.	22.48	19.50	18.
3½ in. o.d. 11 B.W.G.	28.37	24.62	23.
4 in. o.d. 10 B.W.G.	35.20	30.54	28.

(Extras for less carload quantities)

40,000 lb. or ft., and over .....Ba
30,000 lb. or ft. to 39,999 lb. or ft.
20,000 lb. or ft. to 29,999 lb. or ft. 1
10,000 lb. or ft. to 19,999 lb. or ft. 2
5,000 lb. or ft. to 9,999 lb. or ft. 3
2,000 lb. or ft. to 4,999 lb. or ft. 4
Under 2,000 lb. or ft. 6

PRICES

WIRE PRODUCTS

To the trade, f.o.b. Pittsburgh, Chicago, Cleveland, Birmingham, Duluth

	Basing Points Named	Pacific Coast Basing Points†
	Base per Keg	
Standard wire nails....	$2.55‡	$3.05‡
Coated nails	2.55‡	3.05‡
Cut nails, carloads	3.85	....
	Base per 100 lb.	
Annealed fence wire...	$3.05	$3.55
Annealed galv. fence wire	3.40	3.90
	Base Column	
Woven wire fence* ...	.67	.35
Fence posts, carloads...	.69	.86
Single loop bale ties...	.59	.84
Galvanized barbed wire**	.70	.80
Twisted barbless wire..	.70	....

*15½ gage and heavier. **On 80-rod spools in carload quantities.

†Prices subject to switching or transportation charges.

‡Add 25c. per 100 lb. to delivered price—OPA interim increase, Jan. 11, 1945.

BOLTS, NUTS, RIVETS, SET SCREWS

Bolts and Nuts

(F.o.b. Pittsburgh, Cleveland, Birmingham or Chicago)

Machine and Carriage Bolts:

Base discount less case lots

	Per Cent Off List
¼ in. & smaller x 6 in. & shorter	65½
5/16 & ⅜ in. x 6 in. & shorter	63½
½ to 1 in. x 6 in. shorter	61
1⅛ in. and larger, all lengths	59
All diameters over 6 in. long	59
Lag, all sizes	62
Plow bolts	65

Nuts, Cold Punched or Hot Pressed:

(Hexagon or Square)

⅜ in. and smaller	62
7/16 to 1 in. inclusive	59
1⅛ to 1½ in. inclusive	57
1⅝ in. and larger	56

On above bolts and nuts, excepting plow bolts, additional allowance of 10 per cent for full container quantities. There is an additional 5 per cent allowance for carload shipments.

Semi-Fin. Hexagon Nuts	U.S.S.	S.A.E.
Base discount less keg lots		
7/16 in. and smaller	..	64
½ in. and smaller	62	..
½ in. through 1 in.	..	60
9/16 in. through 1 in.	59	..
1⅛ in. through 1½ in.	57	58
1⅝ in. and larger	56	..

In full keg lots, 10 per cent additional discount.

Stove Bolts	*Consumer*
Packages, nuts loose	71 and 10
In packages, with nuts attached	71
In bulk	80

On stove bolts freight allowed up to 65c. per 100 lb. based on Cleveland, Chicago, New York on lots of 200 lb. or over.

Large Rivets

(½ in. and larger)

	Base per 100 Lb.
F.o.b. Pittsburgh, Cleveland, Chicago, Birmingham	$3.75

Small Rivets

(7/16 in. and smaller)

	Per Cent Off List
F.o.b. Pittsburgh, Cleveland, Chicago, Birmingham	65 and 5

Cap and Set Screws	*Consumer Per Cent Off List*
Upset full fin. hexagon head cap screws, coarse or fine thread, up to and incl. 1 in. x 6 in.	64
Upset set screws, cup and oval points	71
Milled studs	46
Flat head cap screws, listed sizes	36
Fillister head cap, listed sizes	51

Freight allowed up to 65c. per 100 lb. based on Cleveland, Chicago or New York in lots of 200 lb. or over.

ROOFING TERNE PLATE

(F.o.b. Pittsburgh, 112 Sheets)

	20x14 in.	20x28 in.
8-lb. coating I.C.	$6.00	$12.00
15-lb. coating I.C.	7.00	14.00
20-lb. coating I.C.	7.50	15.00

PIG IRON

All prices set in bold face type are maximum established by OPA on June 24, 1941. Other domestic prices (in italics) are delivered quotations per gross ton computed on the basis of the official maximum. Delivered prices do not reflect 3 per cent tax on freight rates.

	No. 2 Foundry	Basic	Bessemer	Malleable	Low Phosphorus	Charcoal
Boston	*$25.50*	*$25.00*	*$26.50*	*$26.00*	.....	.....
Brooklyn	*27.50*	*27.00*	.....	*28.00*	.....	.....
Jersey City	*26.53*	*26.03*	*27.53*	*27.03*	.....	.....
Philadelphia (4)	*25.84*	*25.34*	*26.84*	*26.34*	*$30.74*	.....
Bethlehem	$25.00	$24.50	$26.00	$25.50	.....	.....
Everett, Mass.	25.00	24.50	26.00	25.50	.....	.....
Swedeland, Pa.	25.00	24.50	26.00	25.50	.....	.....
Steelton, Pa.	.....	24.50	.....	.....	$29.50	.....
Birdsboro, Pa. (3)	25.00	24.50	26.00	25.50	29.50	.....
Sparrows Point, Md.	25.00	24.50	.....	.....	.....	.....
Erie, Pa.	24.00	23.50	25.00	24.50	.....	.....
Neville Island, Pa.	24.00	23.50	24.50	24.00	.....	.....
Sharpesville, Pa. (1)	24.00	23.50	24.50	24.00	.....	.....
Buffalo	24.00	23.00	25.00	24.50	29.50	.....
Cincinnati, Ohio	*25.11*	*24.61*	.....	*25.11*	.....	.....
Canton, Ohio	*25.39*	*24.89*	*25.89*	*25.39*	*32.69*	.....
Mansfield, Ohio	*25.94*	*25.44*	*26.44*	*25.94*	*32.86*	.....
St. Louis	*24.50*	*24.50*	.....	....	....	.....
Chicago	24.00	23.50	24.50	24.00	*35.46*	.... *$37.34*
Granite City, Ill.	24.00	23.50	24.50	24.00	.....	.....
Cleveland	24.00	23.50	24.50	24.00	*32.42*	.....
Hamilton, Ohio	24.00	23.50	.....	24.00	.....	.....
Toledo	24.00	23.50	24.50	24.00	.....	.....
Youngstown	24.00	23.50	24.50	24.00	*32.42*	.....
Detroit	24.00	23.50	24.50	24.00	.....	.....
Lake Superior fc.	.....	.....	.....	.....	.....	34.00
Lyles, Tenn., fc. (2)	.....	.....	.....	.....	.....	33.00
St. Paul	*26.63*	*26.13*	*27.10*	*26.63*	*39.80*	.....
Duluth	24.50	24.00	.25.00	24.50	.....	.....
Birmingham	20.38	19.00	25.00	.....	.....	.....
Los Angeles	*26.95*	.....	.....	.....	.....	.....
San Francisco	*26.95*	.....	.....	.....	.....	.....
Seattle	*26.95*	.....	.....	.....	.....	.....
Provo, Utah	22.00	21.50	.....	.....	.....	.....
Montreal	*27.50*	*27.50*	.....	*28.00*	.....	.....
Toronto	*25.50*	*25.50*	.....	*26.00*	.....	.....

GRAY FORGE IRON: Valley or Pittsburgh furnace .. $23.50

(1) Pittsburgh Coke & Iron Co. (Sharpesville, Pa., furnace only) and the Struthers Iron & Steel Co., Struthers, Ohio, may charge 50c. a ton in excess of basing point prices for No. 2 foundry, basic, bessemer and malleable. Struthers Iron & Steel Co. may add another $1.00 per gross ton for iron from Struthers, Ohio, plant.

(2) Price shown is for low-phosphorus iron; high phosphorus sells for $28.50 at the furnace.

(3) E. & G. Brooke Co., Birdsboro, Pa., permitted to charge $1.00 per ton extra.

(4) Pittsburgh Ferromanganese Co. (Chester furnace only) may charge $2.25 a ton over maximum basing point prices.

Basing point prices are subject to switching charges; Silicon differentials (not to exceed 50c. a ton for each 0.25 per cent silicon content in excess of base grade which is 1.75 to 2.25 per cent); Phosphorus differentials, a reduction of 38c. per ton for phosphorus content of 0.70 per cent and over; Manganese differentials, a charge not to exceed 50c. per ton for each 0.50 per cent manganese content in excess of 1.00 per cent. Effective March 3, 1943, $2 per ton extra may be charged for 0.5 to 0.75 per cent nickel content and $1 per ton extra for each additional 0.25 per cent nickel.

METAL POWDERS

Prices are based on current market prices of ingots plus a fixed figure. F.o.b. shipping point, c. per lb., ton lots.

Copper, electrolytic, 150 and 200 mesh	21½ to 23½c.
Copper, reduced, 150 and 200 mesh	20½ to 25½c.
Iron, commercial, 100 and 200 mesh 96 + % Fe	13½ to 15c.
Iron, crushed, 200 mesh and finer, 90 + % Fe, carload lots	4c.
Iron, hydrogen reduced, 300 mesh and finer, 98½ + % Fe, drum lots	63c.
Iron, electrolytic, unannealed, 300 mesh and coarser, 99 + % Fe	30 to 33c.
Iron, electrolytic, annealed minus 100 mesh, 99 + % Fe	42c.
Iron, carbonyl, 300 mesh and finer, 98-99.8 + % Fe	90c.
Aluminum, 100 and 200 mesh	*23 to 27c.
Antimony, 100 mesh	20.6c.
Cadmium, 100 mesh	$1
Chromium, 150 mesh	$1.03
Lead, 100, 200 & 300 mesh	11½ to 12½c.
Manganese, 150 mesh	51c.
Nickel, 150 mesh	51½c.
Solder powder, 100 mesh	8½c. plus metal
Tin, 100 mesh	58¾c.
Tungsten metal powder, 98%-99%, any quantity, per lb.	$2.60
Molybdenum powder, 99%, in 200-lb. kegs, f.o.b. York, Pa., per lb.	$2.60
Under 100 lb.	$3.00

*Freight allowed east of Mississippi.

COKE

Furnace, beehive (f.o.b. oven)	Net Ton
Connellsville, Pa.	$7.00*
Foundry, beehive (f.o.b. oven)	
Fayette Co., W. Va.	8.10
Connellsville, Pa.	8.25
Foundry, By-Product	
Chicago, del'd	13.35
Chicago, f.o.b.	12.60
New England, del'd	14.25
Kearny, N. J., f.o.b.	12.65
Philadelphia, del'd	12.88
Buffalo, del'd	13.00
Portsmouth, Ohio, f.o.b.	11.10
Painesville, Ohio, f.o.b.	11.75
Erie, del'd	12.75
Cleveland, del'd	12.80
Cincinnati, del'd	12.85
St. Louis, del'd	13.85
Birmingham, del'd	10.60

*Hand drawn ovens using trucked coal permitted to charge $7.75 per ton plus transportation charges.

PRICES

REFRACTORIES
(F.o.b. Works)

Fire Clay Brick

	Per 1000
Super-duty brick, St. Louis	$64.00
First quality, Pa., Md., Ky., Mo., Ill.	51.30
First quality, New Jersey	56.00
Sec. quality, Pa., Md., Ky., Mo., Ill.	46.55
Sec. quality, New Jersey	51.00
No. 1 Ohio	43.00
Ground fire clay, net ton	7.60

Silica Brick

Pennsylvania and Birmingham	$51.30
Chicago District	58.90
Silica cement, net ton (Eastern)	9.00

Chrome Brick

	Per Net Ton
Standard chemically bonded, Balt., Plymouth Meeting, Chester	$54.00

Magnesite Brick

Standard, Balt. and Chester	$76.00
Chemically bonded, Baltimore	65.00

Grain Magnesite

Domestic, f.o.b. Balt. and Chester in sacks (carloads)	$43.48
Domestic, f.o.b. Chewelah, Wash. (in bulk)	22.00

RAILS, TRACK SUPPLIES
(F.o.b. Mill)

Standard rails, heavier than 60 lb., No. 1 O.H., gross ton	*$40.00
Angle splice bars, 100 lb.	2.70
(F.o.b. Basing Points)	*Per Gross Ton*
Light rails (from billets)	*$40.00
Light rails (from rail steel)	39.00
	Base per Lb.
Cut spikes	3.00c.
Screw spikes	5.15c.
Tie plate, steel	2.15c.
Tie plates, Pacific Coast	2.30c.
Track bolts	4.75c.
Track bolts, heat treated, to railroads	5.00c.
Track bolts, jobbers discount	63-5

Basing points, light rails, Pittsburgh, Chicago, Birmingham; cut spikes and tie plates—Pittsburgh, Chicago, Portsmouth, Ohio, Weirton, W. Va., St. Louis, Kansas City, Minnequa, Colo., Birmingham and Pacific Coast ports; tie plates alone—Steelton, Pa., Buffalo. Cut spikes alone—Youngstown, Lebanon, Pa., Richmond, Oregon and Washington ports, add 25c.

***Add $3.00 per gross ton to delivered price —OPA interim increase, Jan. 11, 1945.**

CORROSION AND HEAT-RESISTING STEEL
(Per lb. base price, f.o.b. Pittsburgh)

Chromium-Nickel Alloys

	No. 304	No. 302
Forging billets	21.25c.	20.40c.
Bars	25.00c.	24.00c.
Plates	29.00c.	27.00c.
Structural shapes	25.00c.	24.00c.
Sheets	36.00c.	34.00c.
Hot rolled strip	23.50c.	21.50c.
Cold rolled strip	30.00c.	28.00c.
Drawn wire	25.00c.	24.00c.

Straight-Chromium Alloys

	No. 410	No. 430	No. 442	No. 446
F.Billets	15.725c.	16.15c.	19.125c.	23.375c.
Bars	18.50c.	19.00c.	22.50c.	27.50c.
Plates	21.50c.	22.00c.	25.50c.	30.50c.
Sheets	26.50c.	29.00c.	32.50c.	36.50c.
Hot strip	17.00c.	17.50c.	24.00c.	35.00c.
Cold strip	22.00c.	22.50c.	32.00c.	52.00c.

Chromium-Nickel Clad Steel (20%)

	No. 304
Plates	18.00c.*
Sheets	19.00c.

*Includes annealing and pickling.

ELECTRICAL SHEETS
(Base, f.o.b. Pittsburgh)

	Per Lb.
Field grade	3.20c.
Armature	3.55c.
Electrical	4.05c.
Motor	4.95c.
Dynamo	5.65c.
Transformer 72	6.15c.
Transformer 65	7.15c.
Transformer 58	7.65c.
Transformer 52	8.45c.

F.o.b. Granite City, add 10c. per 100 lb. on field grade to and including dynamo. Pacific ports add 75c. per 100 lb. on all grades.

Ferromanganese

78-82% Mn, maximum contract base price per gross ton, lump size, f.o.b. car at Baltimore, Bethlehem, Philadelphia, New York, Birmingham, Rockdale, Rockwood, Tenn.

Carload lots (bulk) $135.00
Carload lots (packed) 141.00
Less ton lots (packed) 148.50

$1.70 for each 1% above 82% Mn; penalty, $1.70 for each 1% below 78%.

Manganese Metal

Contract basis, lump size, per lb. of metal, f.o.b. shipping point with freight allowed. Spot sales add 2c. per lb.

96-98% Mn, .2% max. C, 1% max. Si, 2% max. Fe.
Carload, bulk ..... 36c.
L.c.l. lots ..... 38c.

95-97% Mn, .2% max. C, 1.5% max. Si, 2.5% max. Fe.
Carload, bulk ..... 34c.
L.c.l. lots ..... 35c.

Spiegeleisen

Maximum base, contract prices, per gross ton, lump, f.o.b. Palmerton, Pa.

	16-19% Mn 3% max. Si	19-21% Mn 3% max. Si
Carloads	$35.00	$36.00
Less ton	47.50	48.50

Electric Ferrosilicon

OPA maximum base price cents per lb. contained Si, lump size in carloads, f.o.b. shipping point with freight allowed.

	Eastern Zone	Central Zone	Western Zone
50% Si ...	6.65c.	7.10c.	7.25c.
75% Si ...	8.05c.	8.20c.	8.75c.
80-90% Si.	8.90c.	9.05c.	9.55.c
90-95% Si.	11.05c.	11.20c.	11.65c.

Spot sales add: 45c. per lb. for 50% Si, .3c. per lb. for 75% Si, .25c. per lb. for 80-90% and 90-95% Si.

Silvery Iron

(C/L, Per Gross Ton, base 6.00 to 6.50 Si)

F.o.b. Jackson, Ohio $29.50*
Buffalo 30.75*

For each additional 0.50% silicon add $1 a ton. For each 0.50% manganese over 1% add 50c. a ton. Add $1 a ton for 0.75% phosphorus or over.

*OPA price established 6-24-41.

Bessemer Ferrosilicon

Prices are $1 a ton above silvery iron quotations of comparable analysis.

Silicon Metal

OPA maximum base price per lb. of contained Si, lump size, f.o.b. shipping point with freight allowed to destination, for l.c.l. above 2000 lb., packed. Add .25c. for spot sales.

	Eastern Zone	Central Zone	Western Zone
96% Si, 2% Fe.	13.10c.	13.55c.	16.50c.
97% Si, 1% Fe.	13.45c.	13.90c.	16.80c.

Ferrosilicon Briquets

OPA maximum base price per lb. of briquet, bulk, f.o.b. shipping point with freight allowed to destination. Approximately 40% Si. Add .25c. for spot sales.

	Eastern Zone	Central Zone	Western Zone
Carload, bulk.	3.35c.	3.50c.	3.65c.
2000 lb.-carload	3.8c.	4.2c	4.25c.

Silicomanganese

Contract basis lump size, per lb. of metal, f.o.b. shipping point with freight allowed. Add .25c. for spot sales. 65-70% Mn, 17-20% Si, 1.5% max. C.

Carload, bulk ..... 6.05c.
2000 lb. to carload ..... 6.70c.
Under 2000 lb. ..... 6.90c.
Briquets, contract, basis carlots, bulk freight allowed, per lb. ... 5.80c.
2000 lb. to carload ..... 6.30c.
Less ton lots ..... 6.55c.

Ferrochrome

(65-72% *Cr*, 2% *max. Si*)

OPA maximum base contract prices per lb. of contained Cr, lump size in carload lots, f.o.b. shipping point, freight allowed to destination. Add .25c. per lb. contained Cr for spot sales.

	Eastern Zone	Central Zone	Western Zone
0.06% C	23.00c.	23.40c.	24.00c.
0.10% C	22.50c.	22.90c.	23.50c.
0.15% C	22.00c.	22.40c.	23.00c.
0.20% C	21.50c.	21.90c.	22.50c.
0.50% C	21.00c.	21.40c.	22.00c.
1.00% C	20.50c.	20.90c.	21.50c.
2.00% C	19.50c.	19.90c.	21.00c.
66-71% Cr, 4-10% C	13.00c.	13.40c.	14.00c.
62-66% Cr, 5-7% C	13.50c.	13.90c.	14.50c.

High-Nitrogen Ferrochrome

Low-carbon type: 67-72% Cr, 0.75% N. Add 2c. per lb. to regular low-carbon ferrochrome price schedule. Add 2c. for each additional 0.25% N. High-carbon type: 66-71% Cr, 4-5% C, 0.75% N. Add 5c. per lb. to regular high-carbon ferrochrome price schedule.

Low-Carbon Ferromanganese

Contract prices per lb. of manganese contained, lump size, f.o.b. shipping point, freight allowed to destination, Eastern Zone. Add 0.25c. for spot sales.

	Carloads, Bulk	Ton Lots	Less Ton
0.10% max. C, 1 or 2% max. Si	23.00c.	23.40c.	23.65c.
0.15% max. C, 1 or 2% max. Si	22.00c.	22.40c.	22.65c.
0.30% max. C, 1 or 2% max. Si	21.00c.	21.40c.	21.65c.
0.50% max. C, 1 or 2% max. Si	20.00c.	20.40c.	20.65c.
0.75% max. C, 7.00% max. Si	16.00c.	16.40c.	16.65c.

Ferrochrome Briquets

Contract prices per lb. of briquet, f.o.b. shipping point, freight allowed to destination. Approx. 60 per cent contained chromium. Add 0.25c. for spot sales.

	Eastern Zone	Central Zone	Western Zone
Carload, bulk..	8.25c.	8.55c.	8.95c.
Ton lots	8.75c.	9.25c.	10.75c.
Less ton lots...	9.00c.	9.50c.	11.00c.

Ferromanganese Briquets

Contract prices per lb. of briquet, f.o.b. shipping point, freight allowed to destination. Approx. 66 per cent contained manganese. Add 0.25c. for spot sales.

	Eastern Zone	Central Zone	Western Zone
Carload, bulk ..	6.05c.	6.30c.	6.50c.
Carload, bulk ..	6.05c.	6.30c.	6.60c.
Ton lots	6.65c.	7.55c.	8.55c.
Less ton lots ..	6.80c.	7.80c.	8.80c.

Calcium—Manganese—Silicon

Contract prices per lb. of alloy, lump size, f.o.b. shipping point, freight allowed to destination.

16-20% Ca, 14-18% Mn, 53-59% Si. Add 0.25c. for spot sales.

	Eastern Zone	Central Zone	Western Zone
Carloads	15.50c.	16.00c.	18.05c.
Ton lots	16.50c.	17.35c.	19.10c.
Less ton lots..	17.00c.	17.85c.	19.60c.

Calcium Metal

Eastern zone contract prices per lb. of metal, f.o.b. shipping point, freight allowed to destination. Add 5c. for spot sales. Add 0.9c. for Central Zone; 0.49c. for Western Zone.

	Cast	Turnings	Distilled
Ton lots	$2.80	$2.30	$5.00
Less ton lots..	2.30	2.80	5.75

Chromium—Copper

Contract price per lb. of alloy, f.o.b. Niagara Falls, freight allowed east of the Mississippi River. 3-11% Cr, 88-90% Cu, 1.00% max. Fe, 0.50% max. Si. Add 2c. for spot sales.

Shot or ingot ..... 45c.

Ferroboron

Contract prices per lb. of alloy, f.o.b. shipping point, freight allowed to destination. Add 5c. for spot sales. 17.50% min. B, 1.50% max. Si, 0.50% max. Al, 0.50% max. C.

	Eastern Zone	Central Zone	Western Zone
Ton lots	$1.20	$1.2075	$1.329
Less ton lots	1.30	1.3075	1.329

Manganese—Boron

Contract prices per lb. of alloy, f.o.b. shipping point, freight charges allowed. Add 5c. for spot sales.

75.00% Mn, 15-20% B, 5% max. Fe, 1.50% max. Si, 2.00% max. C.

	Eastern Zone	Central Zone	Western Zone
Ton lots ...	$1.89	$1.903	$1.935
Less ton lots	2.01	2.023	2.055

Nickel—Boron

Spot and contract prices per lb. of alloy, f.o.b. shipping point, freight allowed to destination.

15-18% B, 1.00% max. Al, 1.50% max. Si, 0.50% max. C, 3.00% max. Fe, balance Ni.

	Eastern Zone	Central Zone	Western Zone
11,200 lb. or more ..	$1.90	$1.9125	$1.9445
Ton lots ...	2.00	2.09125	2.0445
Less ton lots	2.10	2.1125	2.1445

Other Ferroalloys

Ferrotungsten, Standard grade, lump or ¼X down, packed, f.o.b. plant at Niagara Falls, New York, Washington, Pa., York, Pa., per lb. contained tungsten, 10,000 lb. or more.... $1.90

Ferrovanadium, 35-55%, contract basis, f.o.b. producer's plant, usual freight allowances, per lb. contained Va.

Open hearth $2.70
Crucible $2.80
Primos $2.90

Cobalt, 97% min., keg packed, contract basis, f.o.b. producer's plant, usual freight allowances, per lb. of cobalt metal..... $1.50

Vanadium pentoxide, 88%-92% V_2O_5 technical grade, contract basis, any quantity, per lb. contained V_2O_5. Spot sales add 5c. per lb. contained V_2O_5 ..... $1.10

Silcaz No. 3, contract basis, f.o.b. producer's plant with usual freight allowances, per lb. of alloy. (Pending OPA approval)

Carload lots ..... 25c.
2000 lb. to carload..... 26c.

Silvaz No. 3, contract basis, f.o.b. producer's plant with freight allowances, per lb. of alloy (Pending OPA approval)

Carload lots ..... 58c.
2000 lb. to carload..... 59c.

Grainal, f.o.b. Bridgeville, Pa., freight allowed 50 lb. and over, max. based on rate to St. Louis

No. 1 ..... 87.5c.
No. 6 ..... 60c.
No. 79 ..... 45c.

Bortram, f.o.b. Niagara Falls

Ton lots, per lb..... 45c.
Less ton lots, per lb..... 50c.

Ferrocolumbium, 50-60%, contract basis, f.o.b. plant with freight allowances, per lb. contained Cb.

2000 lb. lots..... $2.25
Under 2000 lb. lots..... $2.30

Ferrotitanium, 40%-45%, 0.10%C. max. f.o.b. Niagara Falls, N. Y., ton lots, per lb. contained Ti.. $1.22
Less ton lots $1.35

Ferrotitanium, 20%-25%, 0.10%C. max., ton lots, per lb. contained titanium $1.35
Less ton lots $1.40

High-carbon ferrotitanium, 15%-20%, 6%-8% carbon, contract basis, f.o.b. Niagara Falls, N. Y., freight allowed East of Mississippi River, North of Baltimore and St. Louis, per carload.....$142.50

Ferrophosphorus, 18% electric or blast furnaces, f.o.b. Anniston, Ala., carlots, with $3 unitage freight equalled with Rockdale, Tenn., per gross ton..... $58.50

Ferrophosphorus, electrolytic 23-26%, carlots, f.o.b. Monsanto (Siglo), Tenn., $3 unitage freight equalized with Nashville, per gross ton $75.00

Ferromolybdenum, 55-75%, f.o.b. Langeloth, Washington, Pa., any quantity, per lb. contained Mo. 95c.

Calcium molybdate, 40%-45%, f.o.b. Langeloth and Washington, Pa., any quantity, per lb. contained Mo. ..... 80c.

Molybdenum oxide briquettes, 48%-52% Mo, f.o.b. Langeloth, Pa., per lb. contained Mo..... 80c.

Molybdenum oxide, in cans, f.o.b. Langeloth and Washington, Pa., per lb. contained Mo..... 80c.

Zirconium, 35-40%, contract basis, f.o.b. producer's plant with freight allowances, per lb. of alloy. Add ¼c. for spot sales

Carload lots ..... 14c.

Zirconium, 12-15%, contract basis, lump f.o.b. plant usual freight allowances, per lb. of alloy

Carload, bulk ..... 4.6c.

Alsifer (approx. 20% Al, 40% Si and 40% Fe), contract basis, f.o.b. Niagara Falls, carload, bulk ..... 5.75c.
Ton lots ..... 7.25c.

Simanal (approx. 20% Si, 20% Mn, 20% Al), contract basis, f.o.b. Philo, Ohio, with freight not to exceed St. Louis rate allowed, per lb.

Car lots ..... 8.00c.
Ton lots ..... 8.75c.
Less ton lots ..... 9.25c.